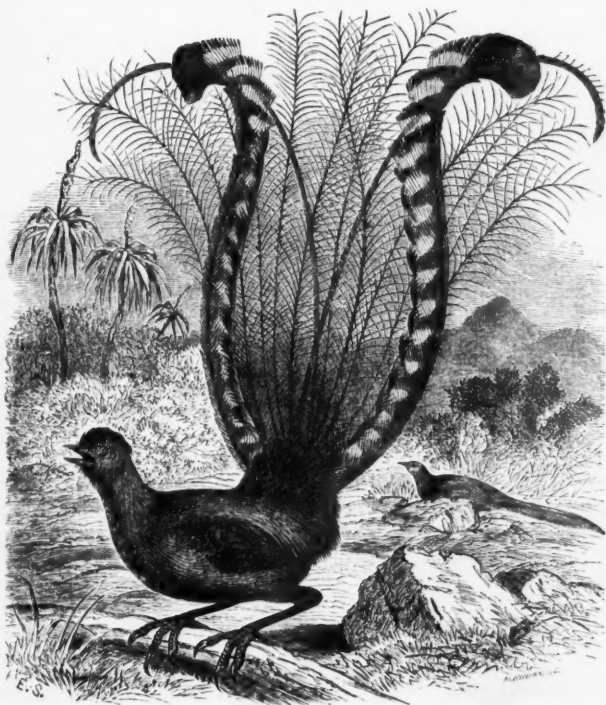


THE  
AMERICAN NATURALIST.

Vol. IV.—AUGUST, 1870.—No. 6.

THE LYRE BIRD.

BY GRACE ANNA LEWIS.



The Lyre Bird finds in the south-eastern portion of Aus-

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tralia a region peculiarly adapted to its nature. At a variable distance from the sea rises a range of mountains, the swell of which is undulating rather than precipitous, while the summits expand into immense open downs and grassy plains. These are studded with belts and forests of trees, and appear like a succession of vast parks. As the hills and plateaus sink into the cup-like depression of the interior, marshy grounds alternate with parched and sterile barrens; but seaward, the soil is of almost inconceivable richness. Here, a tropical luxuriance prevails. Forests of immense, ever verdant, blooming trees, are broken by rich meadow-like districts admirably suited to grazing purposes. Indeed, the country as described, is so charming, that it might be considered almost a Paradise were it not for the intense heat of summer, increased, as it is, by the hot dry winds which blow southward from more northerly regions. Parching droughts are succeeded by torrents of rain, which, collecting on the hills and plains, and advancing through their streamlets, pour in swollen floods down the mountain sides to the sea, carrying destruction on every hand. Thus are the seaward slopes washed into gullies and ravines, which are left obstructed by fallen trees and branches. Over these active nature soon spreads a mantle of greenness and bloom, by means of rapidly growing creeping vines, forming almost inaccessible fastnesses. In these secluded haunts the Lyre Bird hides itself from the gaze of man. It is found over a large extent of country, but is peculiar to the mountain districts of Australia, and especially to those on the southeastern face of the continent. Two species are known; one, *Menura superba*, the well-known Lyre Bird, the other a closely allied species, *Menura Albertii*.

Australia is a country of wonders, where even the leaves of the trees are so disposed that they present but little surface to the scorching sun, and, consequently, are almost valueless for shade; and where, both in the vegetable and animal world, are curious forms existing nowhere else on the globe.

Here is a rich display of birds with gorgeous plumage, and here also are found many remarkable only for their unlikeness to all others. Among the latter is a family, the members of which, with their peculiarly large feet, scratch up grass, herbage, and soil, and throwing these backward, in concentric circles, finally raise a mound which forms a veritable hot-bed. In this they deposit their eggs, and the heat engendered by the decaying vegetable matter quickens the life-germ, as in ordinary hatching does the warm body of the brooding mother.

What is especially curious is that the Lyre Bird, while incubating its eggs in the method common to birds, has a similar habit of raising mounds which it devotes to a wholly different purpose. These elevations seem to be intended as orchestras for the display of musical powers, and both morning and evening they betake themselves thither, frequently while they whistle, sing, or imitate the notes of other birds, raising and spreading their tails with all the pride of the peacock. M. Isidore Geoffroy Saint-Hilaire, refers both the Lyre Birds and the "Mound Builders" to one family, that of the *Megapodidæ*, or the Great Feet. It is by no means wonderful that this thought should have suggested itself to the mind of the learned naturalist, for there certainly is, in several respects, a striking similarity between the Lyre Bird and the Megapodes, a resemblance so strong as to be perceived even by the casual observer. But this similarity seems capable of explanation on other grounds than those of a family relationship, nor need we even suppose that the birds in question belong to the same order.

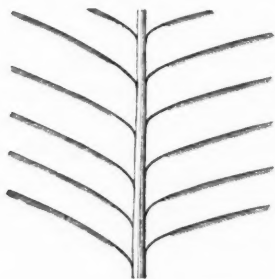
The Lyre Bird has been known for more than half a century, but possibly, our fullest information is derived from the English naturalist, Gould, who, with his wife, travelled in Australia for the purpose of ornithological investigation more than twenty years ago, and who since has, from time to time by his correspondence, obtained facts of much importance to ornithological science. To his pen, and to her

almost magic pencil, we are largely indebted for our knowledge of Australian birds. The pictures of both artists are so life-like that we might well be pardoned for forgetting that we had never heard the music of their songsters, nor beheld the flowering vine where it grew.

The whole collection of birds, forming the originals of Gould's "Birds of Australia," was purchased by Dr. Thomas B. Wilson and presented to the Academy of Natural Sciences in Philadelphia,—a gift to a noble institution of his native city, in which America has reason to rejoice. In this collection, along with other specimens of the Lyre Bird, may be seen that which furnished the half size illustration of Gould. It is somewhat faded by time, but otherwise is in a good state of preservation. From this bird our artist has given the cut heading the present article.

The bird is about the size of the common fowl. Its general plumage is of a dull leaden, or chocolate brown color,

Fig. 80.



Section from loosely barbed Feather,  
natural size.

brightened on the wings, chin and front part of the throat with a reddish tinge, which is much richer during the mating season. The peculiar beauty of the bird, however, lies in its tail, which is in perfection only four or five months of the year. This appendage consists of sixteen feathers, twelve of which, as seen in the engraving, are furnished with loose, slender and

flowing barbs, which are so distant from each other that their effect is that of a background of light and elegant tracery. Figure 80 shows a section from one of these feathers, the barbs, many of which are seven inches in length, having been cut away on either side of the central stem. Four of these feathers are of a closer texture near the base where firmness is required. The two unpliant middle feathers are,



on the outside, destitute of barbs, except a slight fringe near the termination. On the inner side there is a narrow vane gently expanding to a little more than half an inch at the widest part, but contracting towards the end. These feathers bend on either side over the delicate tracery, heightening its effect by their decided lines, as best seen in fig. 79. Figure 81 presents two sections, *a* from the terminal curve, and *b* from the middle of one of these rigid feathers.

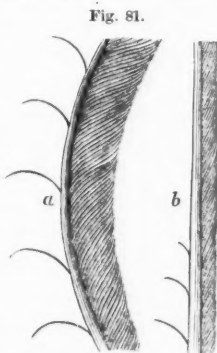
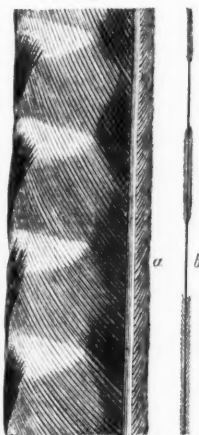


Fig. 81.  
Two sections, natural size, *a* from terminal curve; *b* from middle portion of one of the central, rigid feathers.

But that which gives character to the whole is the arrangement of the external feathers. These curve in such a manner that the two together form the outline of an ancient lyre, an appearance so striking

Fig. 82.



*a*, Section, half-size, from one of the external feathers; *b*, single barb.

as to confer on the birds their popular name. These two feathers contrast with the middle ones by presenting vanes, *wide* on the inner side, on the whole length of the shaft. These vanes, are apparently frilled, but this singular effect exhibited at *a* in figure 82, which is a section, half size, from one of the exterior feathers, is produced by an alternate omission of barbules on the barb, as seen at *b*, fig. 82, which is a single barb. As the barbs are seen edgewise, they present, in the naked spaces, the appearance of transparency, and are usually so described. The microscope, however, proves that in these portions the barbs are not devoid of color. These two outer feathers are of one or more shades of brown and ash color, lighter than the general

plumage, and are tipped with black. In running the tail is lowered and held horizontally, and when of full size it is nearly two feet in length.

Gould describes the Lyre Bird (*Menura superba*) as solitary, never more than one pair, and frequently only one bird being found in the same covert. It is extremely shy, and of all birds is the most difficult to capture, this being ascribed in part to its extraordinary powers of running and in part to the nature of the ground it inhabits, traversed as that is by immense, obstructed gullies and ravines. It seldom or never attempts to escape by flight, but like the Texan Guan, belonging to the Penelopidæ, frequently ascends trees to a considerable height, by leaping from branch to branch.

One mode of procuring specimens is by wearing the tail of a full plumaged male in the hat. The poor bird is deceived, and, approaching to greet a companion, easily falls a victim to the gunner. Any unusual sound, such as a shrill whistle, generally induces it to show itself for an instant; if this favorable moment is not seized instantly, the next it may be half way down a gully. None are so successful in the capture of these birds as are the native blacks of Australia. Restless and active, the *Menura* is constantly engaged in traversing the brush from one end to the other, and the mountain sides from the top to the bottom of the gullies, whose steep and rugged acclivities present no obstacle to its long legs and powerful and muscular thighs. It is also said to be capable of performing the most extraordinary leaps, frequently using this method of escape from its enemies.

Independently of its loud, full call, which can be heard reverberating over the gullies at least a quarter of a mile, it possesses an "inward and varied song, the lower notes of which can only be heard when the listener is within a few feet of the singer." This animated strain frequently ceases suddenly and then recommences with a low snapping sound, ending in an imitation of another Australian singer, the

Satin Bird, and is always accompanied with a tremulous motion of the tail.

Through a letter written from Sydney, Australia, by Dr. George Bennett, and published in the "Proceedings of the Zoological Society," London, we learn something of the Lyre Bird in a state of captivity.

The bird, described in the letter of Dr. Bennett, had been captured when so young that it was only just able to feed itself. It was in the possession of a gentleman who, when he first obtained it, fed it with great care and regularity on worms, grubs, German paste and beef chopped very fine, but as it grew older he added hemp seed, bread, etc.; in short, treating it as he would any member of the Thrush family. Of many specimens, of all ages, which he purchased as companions, this was the only one which survived, the others, brought from the Illawara district, lived but a short time. Apparently healthy and well when they whistled at dusk in the evening, the morning would present only a lifeless form. Others kept in an aviary in Sydney, survived their captivity but six months.

On the fourth of January, no indication of sex could be ascertained from the plumage of the individual described. Twenty days afterwards, when the bird was two years and four months old, two of the peculiar feathers of the male were developing.

This bird was in a constant state of restless activity, running rapidly about the spacious aviary in which it was confined, and leaping upon and over the stones and branches placed in the enclosure, yet with all its restlessness it would follow the call of its owner and take food from the hands of those to whom it was accustomed. It mocked with great accuracy the Piping Crow, Wonga Pigeon, Parrots and various other birds in the same aviary and in the vicinity, and about dusk in the evening was often heard to utter its own peculiar whistle.

Even in Australia this bird was so highly prized that a

liberal offer could not induce the possessor to part with it to send to England.

Another letter from Melbourne, Australia, written to Gould, informs us that the nestling bird is extraordinarily helpless; when taken forcibly from the nest, it walked most awkwardly, with its legs bent inwards, frequently falling, apparently from want of strength to move the large and heavy bones of its legs properly, and this at a time when its height was sixteen inches, and when its wings and tail were already furnished with feathers, although the body was still clothed with down, which, as well as the feathers, was of a dark brown color. When taken from the nest, the bird screamed loudly, and the mother, notwithstanding the proverbial shyness of the species, actuated by her maternal fondness, tried in various ways to deliver the captive. A shot was the reward of her devotion, and with its mother near it, the young *Menura* soon became silent and quiet. Afterward its cries for its natural protector being answered by an imitation of the mother's voice, it was easily led by the sound and soon became very tame. It was exceedingly voracious, but ate wholly in the manner of the Passeres, the nestlings of which hold the open beak in a vertical position, requiring food to be dropped therein. It was sustained principally by worms and the larvæ of ants, and when occasionally it picked up the latter for itself it never was able to swallow them, the muscles of the neck not having gained sufficient power to effect the required jerk and throwing back of the head. Remaining for an unusually long time in the nest, the young *Menura*, like the passerine birds in general, possesses the instinct of cleanliness.

The habits of *Menura Albertii* are very similar to those of its better known relative; the former, like the latter, being famous for its most extraordinary mocking capabilities. Commencing his song before the dawn of day, in fact being the earliest of song-birds, he continues till about an hour after sunrise, besides his own peculiar note imitating the

cries of all the birds in the bush. He then becomes silent and remains so during the day until about an hour before sunset, when he again commences singing and playing about until it is quite dark.

This species chooses sandy localities and feeds wholly on insects, mingled with a considerable proportion of sand, but is without the *crop* found among the gravel-using *Rasores*.

It commences building in May, lays its eggs in June, and hatches its young in July. Choosing some bare rock where there is a sufficient shelter for a lodgement, it builds an oven-shaped nest, outwardly constructed of sticks or roots, tendrils, or the leaves of palms, and lined with soft green mosses, or the skeleton leaf of the parasitical tree ferns,—a substance almost as elastic as horse hair. This nest is completely rain proof and has the entrance on one side.

A nest of this species, with two eggs, is deposited in the British Museum. The nest is about two feet in length, by sixteen inches in breadth, and is domed over except at one end. The eggs, about the size of those of the common fowl, are of a deep purplish chocolate, irregularly blotched and freckled with a darker color.

The nestling is covered with *white* down and remains six weeks in the nest.

In this species the male bird is about four years old before he acquires his full tail; the two centre curved feathers are the last to make their appearance.

Of the nest of *M. superba* we find no equally clear description, but it appears very nearly to resemble that of *M. Albertii*. The eggs of the former species are said to be of a lighter color, and the young to be blind as well as helpless.

The method of nest building, the helplessness of the young, and their passerine manner of feeding, taken in connection with the structure of the *Menuridae*, all point to a position considerably higher than the *Megapodes*. It is true, the young are covered with down, but exceptions occur among the *Fissirostral* birds, as for instance, the Night Hawk

and the Whip-poor-will of the *Caprimulgidæ*, both of which are downy at birth; and the *Menuridæ* may present a similar exception in the group of the *Passeres*, where the young are nearly if not entirely nude.

Gray placed *Menura* among the Wrens. Jerdon assigned it a position intermediate between the Walking Birds,—including the common fowl and the Pigeons and Doves,—and the higher Land Birds.

Most ornithologists of the present day unite in considering it as a member of the *Passeres*, that group which includes our Thrushes, Wrens, Pewees, Humming Birds, Sparrows, Crows and all the multitude of their kind.

Professor Huxley has examined a portion of its anatomy with care, and while referring *Menura* to a group equivalent to the *Passeres*, sees so many distinctions between this and all other passerine genera, that he places it in a section of this group alone, no other birds in the world answering to the Lyre Birds.

Nitzsch, who with equal care, examined *Menura* in reference to plumage, reaches the same conclusion, that it is undoubtedly a passerine genus, but that in certain respects it differs from every other, while manifesting a relationship to the Wrens, the Thrushes, the Dippers and several other allied families.

From all these considerations the probabilities of the case seem to be, that the Lyre Birds are neither Wrens nor Thrushes, nor members of any other family to which they appear to be most nearly allied; but that they may be the living representatives of a group which preceded one, or either, or all of these various families; and, that under a passerine form, they repeat some of the peculiarities of the Megapodes and of their near connections, *in the line of ascent*, the *Cracidæ* and *Penelopidæ*; at the same time reasserting, in a general way, their resemblance to the Walking Birds, while exhibiting a fundamentally passerine nature. In the same manner does each of the vertebrate classes repeat,

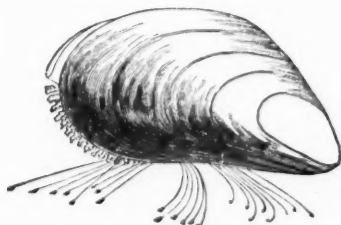
within its own type, characteristics of lower forms of life; and thus do all the higher animals in their embryonic condition, pass through stages representing the lower vertebrates.

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### MUSSEL CLIMBING.

BY REV. S. LOCKWOOD, PH.D.

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CAN any one see a snail travel, and not ask mentally, "how it does it?" The method certainly is curious. A fleshy disk is protruded, and caused to project in the direction of locomotion; it is then spread out flatly, and while slightly adhering to the object over which it is passing, a contractile energy is exerted, and the little animal bearing its house is drawn onward. Thus by the repeated protrusion, expansion, and contraction of this soft organ, in due time its journey is accomplished. Because of this method of progression on a ventral disk, all those shell-fish, or properly speaking, molluscan animals, so constituted, are called by the systematists, gasteropods, a term which means ventral-footed. And in rank these gasteropods stand next to the most highly organized of the mollusca. But some of these shell-encased creatures do not travel at all. Take, for instance, the oyster, called a monomyary, because the valves are held together by a single muscle. This sedate bivalve once settled, probably never moves from that spot. But all

the dimyaries, or two-muscle bivalves, well represented by the common edible mussels, possess a foot, which is not greatly unlike that of the snails. The mussel's foot, however, presents in its class, the least developed condition of this organ, for it is a spinner, rather than a walker; or, as Owen says, "it is subservient to the function of a gland, which secretes a glutinous material analogous to silk, the filaments of which are termed the byssus," which often serves for attachment to rocks. He farther says, "in most dimyary bivalves the foot is an organ of locomotion." Some of the river mussels in babyhood spin a byssus with which to moor themselves against the currents of the stream. When older grown this necessity is overcome, and the capacity just mentioned is lost. Then the adult turns its foot into a plow-share, and is dragged along in the furrow it makes in the mud. The razor-shell alternately bores downwards and propels upward, the foot doing all the work. With the foot as an elastic spring the heart-shell leaps along. But the common black mussel, *Mitylus edulis*, and its despised neighbor, the brown horse mussel, *Modiola plicatula*, who ever saw them walk? Propulsion is not always walking. The scallop with its large adductor muscle, by snapping together its light valves, thus forcibly ejecting the water within against the water without, flits through, and sometimes even skips upon its native element, like an aquatic butterfly. But no pedestrian does so in all Mollusca-dom. Why then should not these pedate bivalves, the mussels, walk as others of their own people do? "For want of brains!" says one. You are mistaken, sir. They have brains, the right kind too, and in the right place,—a real pedal nerve-mass, or ganglion; a little bilobed brain at the very base of the "understanding" itself, that is, exactly under the foot, as was fabled of a very agile dancer, that his brains were in his heels.

Now, if seeing is believing, mussels can walk. We once saw a young brown mussel, of the species *Modiola plicatula*,



about five-eighths of an inch in length, turn his foot to most excellent account. We had pulled the youngster's beard off, and then had deposited him at the bottom of a deep aquarium. The water was probably but poorly aerated, hence he was evidently ill at ease, and to our astonishment he at once began travelling over the pebbly bottom, then up the glass side with the utmost facility and grace. The foot moved precisely as any univalve gasteropod would do, and with the same easy gliding motion. The movement was continued without interruption until it had reached the surface of the water, a distance of not less than ten inches, which added to the distance travelled over the bottom, was probably equal to fourteen inches. At the surface it lost no time in spinning its byssus, which it fixed to the side for a permanent abode.

For its lively colors, perhaps rather ruthlessly, we had picked this little fellow out of a large family cluster, snugly packed in a hole in one of the piles of the dock. It was a large group of all sizes, literally bound together by the silken cords of — attachment shall we say?

A fellow captive was a full grown, black, edible mussel, torn from its anchorage, a stone near by, at low tide. We afterwards found ensconced in this black shell, an amount of intelligence, which filled us with astonishment. If his youthful fellow prisoner could beat him at walking, he was about to accomplish the feat of climbing to the same position by means of a species of engineering of a very high order.

In order the better to understand this singular feat, let us introduce it by the narration of some spider tactics we once witnessed. The insect had captured a large beetle, but could not get it to its web, and seemed indisposed to prey upon it away from its den. It had dragged the prey under the web, which was about two feet above. It ran up to a point close by its web; there it attached a thread, by which it speedily descended, and then attached the other end to its

booty. Again it ascended, affixed another thread, then descended and affixed to the prey as before. Each thread, in sailor phrase, was made taut. After a good many threads had been in this manner attached, each being stretched tightly, and each pulling a little, the weight was seen to ascend a small fraction of an inch. Again the threads were increased, and again the weight ascended a little more, until at last, after incredible labor, perseverance and skill, the little engineer had the satisfaction of success; for its well earned booty, with one final, tiny jerk "brought up" at the desired spot. The explanation of all this is simple. Suppose we take a cord of the material known by the ladies under the name elastic, and attach it to an ounce weight. If but very moderately stretched it would certainly pull at least a grain. Supposing it to do that, a second one would pull with equal force, and it would be but a simple estimate to determine how many threads would be required to raise the entire weight. But enough of this. Now for the mussel.

Placed at the bottom of the aquarium, where it had been for a couple of days, it had succeeded in wiggling itself up to one of the glass sides of the tank. This accomplished it protruded its large foot, stretching it up as high on the glass as it could reach, this organ seemingly adhering very tightly. A little hole opened near the extreme forward end of the foot. This tiny hole was really the extremity of a folded or closed groove. Out of this a drop of white gluten, or mucus, not larger than the head of a pin, was exuded, and pressed against the glass. There was then a slight withdrawing of the foot, simultaneously with an unfolding, or opening of the groove, which contained, as if moulded there, the already completed delicate thread. This done, the partly contracted foot (not drawn into its shell at all, be it understood) was again extended, this time a little higher than before. The groove, or spinneret, was again closed, except the little opening on the surface of the foot, whence another little drop of mucus appeared, which also

was pressed against the glass. Again the foot was withdrawn a little, the lips of the groove unfolded, and the moulded thread set free. This gave thread number two. Each was evidently set at a considerable tension. And in this wise, thread after thread was formed and set. I regret that I did not record the exact number, but am sure that it was about twelve or sixteen, and the time occupied was between two and three hours, when lo! up went the mussel, about three-eighths of an inch high. Yes, he was drawn up by his own cords. He was literally lifted from *terra firma*. Not at all suspecting what was to follow I mentally exclaimed. "This little fellow knows the ropes."

There was next a period of rest. Whether it was due to exhaustion of material, and was meant to allow the secreting gland time to evolve a fresh supply or not, I cannot affirm; but must say that such was my belief, for after an hour or so it set to work again, precisely as before, attaching a new cluster of threads. This cluster was set about five-eighths of an inch higher than the previous one. When this new group of filaments was finished, the same result followed, another lift of a fraction of an inch, but not quite so high as the first. I now suspected its motive—the animal was actually in this singular manner attempting to reach the surface. It wanted to take an airing, and was really in a fair way to bring it about.

While setting its third cluster of threads, I foresaw a serious difficulty in the way, and one against which the spider never has to contend. It was this: after the third lift had been achieved the threads which had accomplished the first lift had changed direction; that is, the ends of the threads, which had pointed downward when pulling up the mussel, were now pointing upward, and were actually pulling it down. Of course the lowermost thread, or threads, would exert the most retrograde traction. Thought I, "Sir Musselman, you will have to exercise your wits now." I rejoice to say that the ingenious little engineer was complete master

of the situation. The difficulty was overcome in this way—as each lowest thread became taut in an adverse direction, it was snapped off at the end attached to the animal. This, as I think, was done by two processes; the one by softening that end of the thread by the animal's own juices, purposely applied, as the pupa in the cocoon moistens its silk envelope, when wishing to soften the fibres, so that it can break a hole through which the imago may emerge; the other by a moderate upward pulling, thus breaking the filament at its weakest point.

The next day our little engineer had accomplished the wonderful feat of climbing to the surface by ropes, fabricated during the ascent. Without delay it moored itself securely by a cluster of silken lines at the boundary where sky and water met, and was there allowed to enjoy the airing it had so deservingly won. Bravo! my little Mussel-man! No acrobat can beat thee on the ropes!

And what are we to say to all this? Blind instinct, forsooth! Who believes it? The wise men of the ages have written as the tradition of the elders—"byssus-bound," of our *Mytilus*. But it can make of its bonds, mooring lines of safety against the storm, and with consummate skill can build a silken stair-way into its own wished-for elysium of delight. It is some three years since the writer witnessed the facts here recorded, and to this day, the sight of a mussel inspires him with profound reflection on the ways of Him who made these creeping things of the sea.

NOTE.—It has seemed to the writer, that in the perfection of movement shown by the *Modiola plicatula*, as given above, a high stage of foot development is indicated, such as would hint at a grade out-ranking *Mytilus edulis*. The figure inserted is that of *M. edulis*; but the process of climbing is the same.—S. L.

## FLOWERLESS PLANTS.

BY DR. A. KELLOGG.

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THE great coal measures of our continent are the grand storehouses of preserved plants from this richest realm of the vegetable kingdom; they are the entombed pioneers that have paved the way, and still light the path of higher forms of life, both vegetable and animal. However much we may to-day value these humble and lower steps on the stage of existence, we are apt to fall far below a due appreciation of their value in the economy of nature; our health, wealth, comfort, nay our very existence more or less, directly depends on the uses they subserve; and still every new dawn brings some novel use crowding the advancing ages until we look back but a few days to our early years, and wonder how we, as well as our forefathers could do without this or that necessary of life. As coal they are the familiar friends of our labors, and the cheerful companions of the domestic fireside. It is not, however, to the dead and fossilized forms alone, but mainly to the living, that we invite a moment's attention.

An idea of minuteness and insignificance too often follows any reference to the simplest plants in nature; yet many attain a great size, such as Tree Ferns and certain Sea-weeds—the former forty feet high, of the size of one's body, and the latter of prodigious length, besides myriads of intermediate forms.

The Fungi, a brief account of which follows, are cellular plants, without flowers, living in the air, often nourished through a stem by an amorphous spawn, or mycelium, instead of a root, and propagated by very minute spores, serving the same purpose as the seeds of flowering plants.

The largest species found in California, is the kind commonly known as Touchwood, or Hard Tinder (*Polyporus*); of a semicircular shape, between one and two feet across,

and six to eight inches thick; this large species we have only seen attached to the living trunks of the Laurel Tree (*Oreodaphne Californica*). Its name signifying *many pores*, describes itself, the lower surface being a mass of little tubes or pores, angular like honey-comb.

As tinder it makes a slow but sure fire and good coal, wind proof, so that as a slow match for blasting purposes it is perfectly safe. It burns at the rate of an inch in five minutes; this rate, of course, will vary a little with thickness. Dipped in nitre and dried it is even more sure on gunpowder than fate itself. The corky kinds of fungi to which this belongs continue to live and increase for many years, although in general mere size is no reliable index of age in this field of inquiry, for we know that under favorable circumstances the Scaly Polyporus (*P. squamosus*), found on the trunks of dead trees, attains, perhaps, the largest size of any known. Instances have been recorded of its measuring seven feet five inches in circumference, and weighing thirty-four pounds avoirdupois, growing to these vast dimensions in the short space of three weeks.

The power of these plants to disintegrate the hardest wood is very remarkable, causing it to yield much more rapidly than the ordinary influences of the weather. Among the greatest agricultural obstacles in the vast timber clearings of the South and West, and indeed of most new countries, are the old stumps, which, if left simply to the action of the weather, might be something less than half a century in decaying; yet if these were simply sprinkled with water in which fungi had been washed, they would shortly crumble beneath the magician's wand, a mere shreddy mass of interlaced cottony touchwood, the tissues and cells of which would be seen to be traversed and disorganized by this amorphous mycelium. We know from actual observation that where heavily timbered land is required to be cleaned off entirely, it often costs from fifty to one hundred dollars per acre. Perhaps to estimate it in human flesh, we might adopt

the western proverb, that it wears out one generation to bring the land into tolerable tillage for the next. Only a few of these plants are known to us, nor do we know their uses except in a few instances. Many of the species we know are very destructive to the trunks of living trees, on which they grow. In the first instance they may grow on parts which are diseased, but the insidious mycelium spreads with great rapidity; the moment any growth of this kind appears the tree should be felled, or if a valuable ornamental tree, the parts affected should be carefully removed, and a strong solution of sulphate of copper or corrosive sublimate be supplied.

Most Polypori are close and tough in their texture, and rather indigestible; still some are eaten. Berkley declares that the most delicious of all fungi is the *P. casareus*. Several other species besides our *P. igniarius* are used as tinder and moxa, and some are said to make famous razor-strops. Certainly a more satiny cushion could not be devised. The common small species, with variegated concentric rings (*P. versicolor*), is used to lure insects from the mycologist's more valuable specimens. One is used in Russia, pounded and put in snuff, to improve its narcotic properties; another has been manufactured into coarse clothing. Only one, I believe, is worshipped, *i.e.*, the *P. sacer*, a most striking object, much venerated by the negroes on the West African coast.

Perhaps many of us have experienced the kindred pleasures of paradise on a walk in the woods after a thunderstorm in the warm days of August, and felt our lungs swell with a thrill of strength to the very fingers' ends, while breathing the balmy odors of the wood; it was not all the breath of flowers, nor foliage, nor any conspicuous form of commonly recognized vegetation. Some may remember having searched for the sweet knots to take home with them, hiding the uncouth thing in the house in order to excite the pleasing wonder and prying curiosity of the loved ones, as

to where that sweet odor came from! It was the sweet scented Polyporus, another species of the same plant. Similar fragrance is observed in one species growing on the birch which is used to scent snuff; another like the soft contents of the puff ball, is celebrated for staunching blood. This fungus has been much used as a remedy, and its virtues vaunted in this country for the cure of consumption in its early stages; so also have similar surprising effects been attributed to the use of *Agaricus emeticus*. The phosphorescent agarics of the olive and palm are luminous like large fire-flies, and a few suffice to light up a large room sufficient to read by.

It is often said that some allied mushrooms are unwholesome, and therefore there is danger, and upon the whole, it is best to let them alone. In reply, might we not inquire if the carrot, celery, parsnip, angelica and anise are not allied to the deadly hemlock? The potato, egg-plant and tomato are also close akin to the poisonous night-shade. The innocent arrow-root, too, is the actual product of the fearful woorai, or *maratta arunamacea*, with which the savage poisons his arrow-points in war. The universal practice in Russia is to salt fungi; and beside they are often subsequently washed and treated with vinegar, which would be likely to render almost any species harmless. Any one familiar with our coast and bays will not fail to hear of cases of poisoning with shell-fish, and there are also sad cases on record of death from these as well as the edible mushroom, or *Agaricus campestris*. Fungi vary in quality with climate, meteorological conditions, soils, etc., so that the safest way is to eat only those raised in garden beds for the purpose; always bearing in mind that much depends upon the mode of preparation and cooking.

The Grape Disease (*Oidium Tuckeri*), is the result of a parasitic fungus, terribly devastating to the wine crops of Europe, the losses of which are estimated by millions, and so frightful as to threaten starvation to thousands; fortu-



nately, the native vines of America are not subject to it, even when cultivated in proximity, on the European Continent.

This fungus plant is easily destroyed by dusting on them flowers of sulphur with a soft brush, when the fruit is well set, about the size of a pea. One application, the Hon. George Hobler, of Alameda, assures me, has proved an infallible remedy with his foreign grapes; had he known its value sooner it might have saved his English gooseberries, which he had plowed up and cast away in utter despair. Currants, and other fruits, are also victims at times. Indeed, one species, *Oidium albicans*, called Thrush, grows in the mouths of children. This can be transplanted and cultivated; a weak solution of potash or saleratus will dissolve out the albumen and leave the plant wholly exposed and unchanged. Now, the use of this knowledge is, that the same law and similar remedies are indicated here, as where it attacks the vine, namely, to kill the parasite and cure the disease. It is always pleasing to be able to see in rational light why our grandmothers were right in being so partial to sulphur. One dram of sulphite of soda to an ounce of water is a sure cure.

The *Oidium fructigenum* is often seen in whitish puberulent spots of a greenish gray on oranges; and on apple trees it destroys the fruit while still hanging to them; beans, plums, peas and hops, etc., are also often destroyed, or much injured by its ravages.

A digression into the rationale of remedies for these evils would greatly interest us, but we must forbear; they turn, however, upon a few simple physiological facts—in a word, the Flowerless Plants on land or sea have an oily or shiny coating to the spores, neither the sea water nor air actually touch them; but the moment this adhesive oily or mucilaginous matter is destroyed, they perish; hence the use of ley, lime, ashes, etc., together with many chemical washes.

It is impossible in a short article like this to dwell upon

all the mildews, white and black (*Puccinia* and *Antennaria*) which ruin wheat fields in the North, and orange groves in the South. Rust, or red mildew (*Uredo rubigo*), which, however, is not so injurious as some others, but is still a serious evil—the smut (*Uredo segetum*)—bunt (*Uredo caries*), where the grain looks well, but is a mass of black fetid sporidia when crushed. If any one of these fungi, out of a thousand, would spread famine and death broadcast over the earth, is it of no use to investigate the subject? As on his rolling main no navigator, coasting its dangerous shores ever contemns the chartings and soundings of science, so let the landlubbers learn to do on theirs.

A brief allusion to a few points in so large a field is all it is hoped to do; but the bald botany of the subject is only to aid the end in view, namely, the practical use of the knowledge; this requires that we add a few words upon the ill effects on men and animals, as well as the gross wealth and prosperity of a country. That the diseased or fungoid cereals referred to are very dangerous to man and beast, no one of proper information will doubt or deny; why they are less dreaded than the larger poisonous fungi, is sufficiently manifest. The Ergot of grasses (e. g. *Agrostis*, *Festuca*, *Elymus*, *Dactylis*, etc.), but chiefly of rye, is one of this class; the fungus is perhaps better known as spurred rye—the symptoms of poisoning from eating it, are general weakness, intoxication, creeping sensation, cold extremities and insensibility; then follow excruciating pains, and lastly, dry mortification—the fingers and toes drop off.

I have known only one case so suddenly serious that the patient lost the fingers and toes; but very many instances where ultimate death of both men and cattle have followed the use of fungoid grain; and also mouldy provisions. Cheese, however, is supposed to be improved by it, and in parts of Europe they inoculate with a plug taken from a mouldy, and introduced into a new cheese; or the curd is exposed for a day or so before making up, so that the float-

ing spores in the air may inseminate the mass. If to some they are improved, there is a species or condition of mould that I have every reason to believe is dangerous to persons of a consumptive predisposition. The black dust of hay fields (*Ustilago*) acts in a more direct manner—hay makers are attacked by violent pains and swellings in the head and face, and great irritation of the entire system. The blue bread mould (*Pencilium*), or a condition of it is found on the inside of casks, the spores of which prove poisonous; this is well illustrated by the two coopers who entered a great tun to clean off this mould, when they were seized with violent pains in the head, giddiness, vomiting and fever, scarcely escaping with their lives.

Alluding to fungi on forests, fruits, shrubberies, grapes and grains, a passing word will not be amiss on the potato disease, caused by the *Botrytis infestans*; its ravages, however, are too well known to this generation for particular details. Another, the *B. bassiana*, attacks the silk worm in China and Syria. The *Achorion microsporon*, *Tricophyton* and *Lychea agrius*, are well known to attack man, to say nothing of the strong probability of their being the origin of malaria, typhus, cholera, and the plague, etc., besides numberless epidemics, which, at least, are preceded and unduly accompanied by these strange and often microscopic wonders of the vegetable kingdom. Unlike other plants the fungi in place of purifying the air—at least, so manifestly—from the poisonous carbonic acid and the other elements of injury, and giving us back the vital oxygen, steal away this, and shed on the shadowing wings of every dark corner of the earth an element, which, if it exceeded a tenth, would annihilate the race; besides all this, they throw off hydrogen, which causes abrasions and sores—mostly of the mucus membranes and air passages; and, finally, as we have seen in some cases, they exhale specific poisonous substances; while myriads of spore-seeds so minute and light as to be scarcely less volatile than ether itself, are poured forth

upon the gentlest breeze, were it even so slight as to leave the gossamer unmoved. Let us not, however, look altogether upon the dark and dismal side of the picture. They all may be, nay, are, beneficent forms of life, only less poisonous and otherwise injurious than would be the fleeting noxious vapors they catch from the atmosphere, as their kindred do the filth of the mighty deep, and hold it back from its fiendish mission of misery to mankind. They come mostly in the melancholy autumn days when the flowers are fading away, and the leaves are falling to decay, when the beautiful fairies have fled from the grassy lawns; when no naiads dance in glee down the glittering wavelets to the boundless ocean; for then even the brook itself loathes and leaves its slimy bed, which, with the aid of crypts, reptiles and creeping things, can scarce suffice to stay or temper the impending plague. Like a grizzly beast of prey, it walks in thick darkness, or sits at bay in the sun-sucked fogs; or, perchance, winds its slow length invisibly along, like a spirit serpent in the stagnant air of the vales and deep mountain gorges; or coils its envenomed form in the dismal cellars and filthy by-ways of our cities. It is notorious that in stagnant water, or in that other fluid, the *air*—where decomposing organisms take on innumerable forms of life—there is the purified and purest portion of the pond. Even the noisome mosquitoes, dragon flies and reptiles, with flowerless plants, render fluids salubrious that were hastening to putrefaction and death.

That like assimilates to like in the realms of spirit and of matter is a universal law that will be seen, and, sooner or later acknowledged. From the vegetable kingdom many examples might be drawn in illustration, and, perhaps, few will be more strikingly in point than the Fly Agaric (*Agaricus muscarius*), so named from its being used to poison flies. This intoxicating fungus is often seen in hilly or subalpine regions, particularly in our forests of fir and birch, where its tall, trim, white stem, and rich scarlet cap, studded with

white, scaly warts, form a beautiful contrast to the soft, green carpet of moss from which it springs, and the elegant emerald foliage that overshadows it. This very poisonous fungus is to the north-eastern nations of Europe and Northern Asia, what opium and hemp are to India and China, awa to the Sandwich Islanders, cocoa to the Peruvians, and what tobacco and various spirituous liquors are to Europe and America. Thus we see, as a reverend writer justly remarks, that the indulgence of these narcotic cravings has at last degraded itself to so low an object in the scale of nature as a common toadstool; and that, too, in the most revolting manner possible to conceive. The Kamtschatkan and Koriac races are so dreadfully degraded that they personify this fungus under the name of *Mocko Moro*, as one of their household gods—like the god Siva of the Hindoo Thugs; if urged by its effects to commit suicide, murder, or some other heinous crime, they pretend to obey its commands, and to qualify themselves for premeditated assassination, they have recourse to additional doses of this intoxicating product of decay and corruption. When steeped in the expressed juice of the native whortleberry, it forms a very strong intoxicating kind of wine, which is much relished. But the more common way of using the fungus is to roll it up like a bullet and swallow without chewing, otherwise it would disorder the stomach. Dr. Greville in the fourth volume of the "Wernerian Transactions," says, one large or two small fungi are a common dose to intoxicate for a whole day, *i.e.*, by drinking water freely, which augments the narcotic action. The desired effect comes on from one to two hours after taking the fungus. Giddiness and drunkenness follow in the same manner as from wine or spirituous liquors; cheerfulness is first produced, the face becomes flushed, involuntary words and actions follow, and sometimes loss of consciousness. Some persons it renders remarkably active, proving highly stimulant to muscular exertion; but by too large a dose violent spasmodic effects are produced.

So exciting is it to the nervous system of many that its effects are very ludicrous; a talkative person cannot keep silence or secrets—one fond of music is perpetually singing, and if a person under its influence wishes to step over a straw or stick, he takes a stride or jump sufficient to clear the trunk of a tree. It is needless to say delirium, coma and death often results as in the case of alcoholic spirits.

The most remarkable fact is that the fluids of the debauchee become similarly narcotic, and are therefore preserved in times of scarcity. Thus a whole village, as some say, may be intoxicated through the medium of one man, and thus one fungus serves to prolong these most fearful and disgusting orgies for many days together. It is worthy of note that the very same erroneous impression as to size and distance produced by this plant, are also created by the *hasheesh* of India, and are also frequently noticed among idiots and lunatics. It has been suggested that many of these may have suffered martyrdom at the stake during the witch mania of Scotland, owing to their natural and temporary defect—*inability to step over a straw* being considered the conclusive test of familiarity with evil spirits. And with those devoted to its intentional use, we should say it really does come within one of it. It is curious to observe how the effects produced by various species of poisonous fungi should be so very similar to alcoholic liquors. The effects in both cases may be traced to a kindred cause. Alcohol, as all know, is the product of fermentation or corruption, arrested at a certain stage of fungoid growth, as also is the case with the yeast and rising process of the pastry cook and brewer. Having, hence, one common origin, it is less wonder their effects should be similar; and, we may add, they tend to produce a like poisoned condition in the human body. This is exemplified in excessive beer and liquor consumers, the slightest accident or even scratch on which will often cause death.

Thus they become the short-lived mushroom humanity

that blooms on the very verge of decay. That these things are nevertheless intended to subserve some good purpose is not denied; every degree of life is wisely provided for, even the worst. This is most manifest from the lowest lichen to the highest vegetable structure; and when mankind observe the true equilibrium of order, the race is justly represented and designated a microcosm, in which from the highest to lowest all things are duly subordinated to an end or use.

The common Puff Ball (*Lycoperdon bovista* and *pratense*) requires special notice. When slowly burnt and the fumes inhaled it produces intoxication, followed by drowsiness and then by perfect insensibility to pain, with loss of speech and motion, while one is still conscious of everything that happens around—realizing the truth that it is possible for one to lie stretched on the funeral bier sensible to weeping friends; aware of the last screw being fixed in the coffin and the last clod clapped down upon us in the churchyard, and yet unable to move hand or lip for our own deliverance. Experiments have recently been made on cats, dogs, and rabbits, and similar effects have been found to invariably ensue. And for ages it has been used in this manner for stupefying bees, and thus robbing their hives with impunity. If the inhalation in man, however, be continued too long, vomiting, convulsions, and ultimate death results.

Much of this lore is still closeted, perhaps, mainly in the secret chambers of the past; the fumes of many plants have been used as spells, enchantments, and to induce spectre seeing, etc., of which we may name some on a proper occasion. In the order of nature, all auras are adapted to human requirements, and under the influence of the last named, unlike our artificial chemicals—chloroform and ethers—the individual remains conscious all the time. I have myself, as well as thousands of others, experienced similar slight trance states of rapture, sweetly and softly celestial, and yet most of all alive to consciousness, with only a dread lest some gross vociferous burst from beneath should break the spell; a dread lest some one should speak to you.

That these fungi are sometimes purely meteoric, is proven by their fastening upon iron and rapidly extending themselves; here the matter is manifestly conveyed to them by the air and moisture. Many Polypori, too, grow on hard tufa of volcanoes without a particle of organic matter. Nevertheless, unhealthy conditions of air, soils, and the object attacked, we have often seen to be true concomitants, so that in most cases they may be deemed consequences, rather than causes, if one prefers that view of the subject—our chief concern being a review of the facts. Some of them, indeed, require certain specific conditions so well known that they can be grown to order, leading shrewd observers to the plausible conjecture that they are of spontaneous generation.

Berkley and McMillan, from whom we collate, mention that in Italy a kind of Polyporus, greatly relished, is grown simply by singeing the stump or stems of hazel-nut trees and placing them in a moist, dark cellar; other instances of extinct fires being followed by fungoid scavengers, imps of the pit, are too well known. Now, as charcoal and other black bodies absorb many hundred times their own bulk of fœtid gases—for the color, *black*, is philosophically and devilishly filthy, and it ardently desires or affiliates with, and pertinaciously clings to foul air and odors; and, as a very fiend, only yields them up readily as contagion, eluding, perchance, the alchemist's wand—the vile spell is hardly broken but by that great power of the universe, *heat*. Hence we see why they make such apt servants and meteoric media for their masters, the Fungi. These plants and other parasites sometimes invade living organisms, both animal and vegetable, in their most vigorous state, but we may safely say, in general terms, that whatever fouls or lowers the standard of life in the human, in the animal, or in the plant, surely invites these disorder-inspecting gnomes from beneath; which move to and fro in the earth—messengers of the shades!—ready to alight upon and claim as their own all such trenchers upon the outer realms of death. It is therefore



not wise, neither naturally, morally nor spiritually, to venture too near that other place.

I well recollect, many years since, while residing in the pine forests of Russell county, Alabama, one of my neighbors (Oliver) was desperately annoyed by some mysterious fætor, like carrion—only more so. A general search was instituted, and at length an abominable fungus was found growing beneath the steps of his log cabin. I have only known of two instances of this kind. It may, however, be common in the piney wood sections of our country. This is a species of *Clathrus*, a putrid, revolting, jelly-like mass of raw flesh just beneath the loosely-lifted soil. It diffuses such a loathsome stench that none could endure it.

One might object that this stench was owing to its putrid state; not so at all; it is the natural fætor of the fungus, just as we find in our common pole-cat weed and cabbage, several arums, stapelias, etc. Unless the hiding place of this pest is discovered—and little peace is likely to come to the premises until it is—and the intolerable nuisance abated, with its surroundings, they are apt to repeat themselves. There is a popular superstition that if any one should accidentally touch this monstrous mass it would produce cancer. Hence the custom of carefully covering it over with leaves, moss, earth, etc., to prevent the possibility of a contagion. Now, whatever we may *think* of such superstitions, let us *respect*—I had almost said *reverence*—the intuitive promptings from that purer and better world within and above this lower region of filth and contagion, which causes the sensitive and tidy spirit to shudder at, shrink back from and shun such exposures.

We do most solemnly warn the reader that the most vigorous health may not too rashly presume upon a forced, fool-hardy or wanton and careless contact with these, or with those *other* fungi—the moral mildews, moulds and blites of man's paradise.

Recent researches seem to show us how little we yet know,

and well do they warn us not to form too hasty conclusions; nevertheless, with one voice they proclaim these fungi to be more abundant and much more important than is commonly supposed. They are undoubtedly the secret or obscure and often unsuspected proximate causes of many diseases of animals and of man—operating either directly or indirectly. We have already seen that the ergot fungus of ill-drained localities found on the Broom-grass (*Bromus*), and Meadow or Spear-grass (*Poa*), etc., but chiefly on the Rye, sadly deteriorates the blood in every degree from intoxication, inveterate ulceration, and mortification to absolute death, or from first to last, both in man and animals. We cannot dwell here upon the indirect dangers of eating the flesh or drinking the milk of such disordered brutes; the effects are scarcely less deleterious than the fungus itself.

These remarks are true in general as respects other causes or other kinds of vicious vegetation. The black dust of hay fields alluded to (*Ustilago hypodytes*) acts directly, throwing one into a most violent and dangerous fever; so also, the spore dust of the common blue mould (*Pencillium*), as in the case of the coopers previously mentioned. Thus we see that these plants act powerfully and strangely on man, whether their ethereal fumes are inspired, snuffed, or their substances taken into the stomach, or even vegetate on the outer or inner surfaces of the body. They are also known to abound in the lungs of web-footed quacks, and the brains of many animals, but we believe they rarely reach the brains of some Esculapians.

A French chemist and botanist, M. Dutrochet (as quoted by the Rev. E. Sidney), says he found every sort of vegetable matter, with only a drop or so of almost any acid, yielded a mould; but when albumen contained a neutral salt none appeared. If salts of mercury are present the mould is stopped. On the contrary oxides of lead hasten it; oxides of copper, nickel and cobalt retard it; oxides of iron,

zine, antimony and other minerals have no effect; all perfumes stop it.

Passing in this flying review some of the lower forms of flowerless plants of forests and fields, with a few parasites on man and animals, only touching here and there an interesting and suggestive fact, we finally offer a word on those found upon our farm fixtures, houses, and especially all timber structures, although not confined to them alone, for even the wall, in the pride of its strength, crumblingly bows beneath their stealthy tread.

Builders have a woful knowledge of numerous fungi found on wood, *e. g.* the *Polyporus destructor*, truly as its specific name signifies, a *destroyer*; also *P. thelephora*, from a Greek word, meaning nipple, by reason of its teated surface; and *P. sporothricum*, from the little pore-tubes having hairy filaments hanging out; the one, however, most familiar to me from my earliest recollection is the Weeping Morel (*Merulius lachrymans*), a crying evil. Both this and the *M. vastator* are sufficiently devastating to all timbers in warm, moist situations where there is no free circulation of air, as in hollow trees, cellars, wainscoting, timbers of ships, sills, sleepers, etc. These invaders, little less than legion, all pass under one common designation, the *dry rot*.

Weeping morels at first appear in a white spot, or point, spreading their filaments flat over the surface of the timber in rounded white cottony patches from one to eight inches broad, and so onwards; near maturity it forms folds of yellow, orange or brown, weeping Madeira wine colored tears; they soon after mature myriads of dirty, rusty-colored sporules which spread destruction far and wide; wood, books and walls crumble in its consuming path; buildings often, though taken down and the stones scraped and fired, scarcely suffice to stay the scourge. Is this the leprosy of the wall spoken of in Leviticus? Heat applied to dry wood only hastens the malady. It can be forestalled by cutting the timber in winter when the sap is out; and, better still, by immersion in

water for a long time, to fully supplant or extract the entire juices, as is often practiced by the best ship-builders and honest wheelwrights, carpenters, etc., who regard a worthy and enduring reputation. It is said that the ships in the Crimea Sea suffered more from this insidious foe than from the ravages of fire, or the shots and shells of their enemies. We have seen samples of this light, crumbly, papery shelled wood, with its weight and strength totally consumed.

A strong wash of corrosive sublimate solution over the timbers of cellars on which these deliquescent or weeping morels so dampen it, are at once rendered dry, and the evil often entirely arrested in the midst of its havoc.

Lastly, most of us have heard, and many have no doubt seen, specimens purporting to be a caterpillar turned into a plant, or some such similar foolishness. We have one in the herbarium which any one may see at their leisure. This is one of those parasitic fungi, that rob and kill in order to supplant and live on others gains; the dying grub's head never sprouts up as a plant, but the seeds or spores of the *Spheria Robertsii* alight upon the caterpillar of a moth, the *Hepialus*, when it buries itself in the mossy woods to undergo metamorphosis, and by its growth destroys the napping grub. Two species of these are used by the Chinese, who sell them in bundles of eight or nine, with the worms attached, which they place in the stomach of a duck and roast for the patient to eat.

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#### VARIATIONS OF SPECIES.

BY A. H. CURTISS.

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IN the March number of the *NATURALIST* we observe an account of a remarkable growth of *Bidens chrysanthemoides*, and as the writer seems to fear that his story may be considered an exaggeration, we come to his support with one

twice as *tall*, which, happily, refers to the most nearly related species, *Bidens cernua*. While collecting along the alluvial, marshy borders of the Potomac below Alexandria, some years ago, we found this species (not before discovered so far south) growing to the extraordinary height of five feet. This, compared with Gray's maximum height, will be seen to be in the ratio of six to one; while in the instance of *B. chrysanthemoides*, it was only three and a half to one. Our press would barely admit of smaller branches, while in collecting the same species in New York, we have easily pressed two entire plants side by side. As if this were not a sufficiently surprising effort of nature, on proceeding some distance farther, we came upon some plants of *Oxalis stricta* (an eccentric plant in more than one respect) fully five feet in height, and widely branched. We do not apprehend that such statements will be discredited by any person familiar with the vegetation of such localities. We mention them as curiosities in vegetable growth, and not as matters worthy of permanent record, or of a place in a work of the nature of the "Manual."

Such variations in the size of plants appear to be seldom attended with any material change of specific characters, and are therefore of less interest than those produced by difference of latitude and longitude, or by change of station, as from wet to dry locations, from sunny exposures to shade, from marine to fresh-water localities, or from mountain to valley, and *vice versa*. These are all fertile in effects of the greatest interest to modern theorists, and no botanist should fail to make them a subject of special study. Such observations inevitably suggest a former unity of many of our species and genera, and result in the correction of too wide distinctions. The two species of *Bidens* referred to, together with *B. connata*, are strongly suggestive of a common parentage; and when *Bidens frondosa* is compared with *Coreopsis bidentoides* (especially since the former has been found with upwardly barbed awns), it is difficult to perceive

a proper dividing line between the two genera. We do not anticipate a loss of the genus *Bidens*, however, though probably no collector would object to its thorough extermination from our flora, with all its "pitchforks" and "Spanish needles," together with the *Desmodiums*, which in autumn force the herborizer so extensively into their service in transporting their "fearfully and wonderfully made" legumes.

As examples of the manner in which one genus may merge into another, and one species into another, we cite two instances which have lately fallen under our observation. The first is that of the *Gymnostichum Hystrix* of Schreber. This remarkable grass was apparently separated from the Linnæan genus *Elymus*, upon the single character of the absence of glumes. In this section of the country, however, we find it with *well developed* glumes, which are *persistent* after the spikelets fall. The glumeless and intermediate forms also occur, but the one most common has rigid, awn-like glumes situated precisely as in *Elymus*, of nearly an inch in length, and with one prominent nerve, being therefore triangular, though appearing terete. We have never found the paleæ dentate (as figured in Pl. 11 of Gray's Manual) in any form of the species, and the "pedicels" are evidently the joints to which the glumes are attached, and are but little longer than in some species of *Elymus*. Were the spikelets appressed as in *Elymus*, it would strikingly resemble some species of the latter in aspect, and as there appears to remain no constant technical distinction of any importance, we see no reason why its former name, *Elymus Hystrix* L., should not be restored.

Our second case is that of *Eupatorium aromaticum* L., which we are convinced is but a variety of *E. ageratoides* L. The latter species is very common at the North in low, rich woodlands, and has large, thin and smooth leaves, which, we think, vary very little in size and shape. On reaching Maryland (except in the mountains) and the coast this species seems to be supplanted by one having the same peculiar flower-heads, but lower and less branching, with

smaller corymbs, and smaller, thicker and pubescent leaves. This species is common in Virginia in dry copses and open woodlands, but varies greatly, so that we are puzzled in selecting typical specimens. On coming to the Piedmont region, however, the problem was soon solved, for here we found that it was no longer confined to dry and somewhat exposed and sterile situations, and that in proportion to the degree of shade or richness and dampness of soil in which it grew, so the leaves became thinner and larger, and the whole plant more robust, till it could no longer be distinguished from the true *E. ageratoides*; and on visiting the neighboring mountains, we found the latter species growing in great abundance. If, therefore, the generally accepted rule be applied to this case, *E. aromaticum* must be considered to be a variety of *E. ageratoides*. In a very similar manner *Acalypha gracilens* Gray, varies into *A. Virginica* L., and it has very properly been reduced to the condition of a variety by Professor Gray. In this connection we would mention that we have found *Eupatorium aromaticum* with leaves beautifully whorled in threes. As the same arrangement has been observed in another species, it would seem that the genus is inclined towards this mode of leaf-arrangement, which makes that of *E. purpureum* appear less anomalous.

Before closing we would add to the list of monœcious and dicecious plants which have been found with androgynous inflorescence (see March number of the NATURALIST, p. 46) an instance of the same mode of inflorescence in *Fraxinus Americana*. In the spring of 1867 we observed in this county (Bedford Co., Va.) a tree of this species with panicles thoroughly androgynous; but in this instance, as if a violence had been done to nature, every flower afterwards became changed to a mass of small, contorted leaves, bending the branches with their weight, and presenting a truly remarkable appearance.

NOTE.—*Bidens cernua* and *B. chrysanthemoides* might also have been adduced as species which run together. We beg for a sight of these tall Virginian specimens.—A.G.

## A STROLL ALONG THE BEACH OF LAKE MICHIGAN.

BY W. J. BEAL.

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THE south-west extremity of Lake Michigan is surrounded by a low, sandy beach, back of which are low land and marshes. Let us take a stroll with our NATURALIST friends along the lake shore south of Chicago. In place of the rocks and sea-weeds, radiates, shells and crustacea of the Atlantic coast, here are only fragments of cork, chips, sticks, now and then a mutilated specimen of an *Unio*, or a few small, dead gasteropods, or their empty shells. Among the land plants we shall find more to interest us. The student from Salem (Mass.), or the coast of New Jersey, recognizes the Beach Pea (*Lathyrus maritimus*) which we believe is never found far from the salt water, except along our great inland lakes. Here also is the Sea-rocket (*Cakile Americana*), a radish-like plant, and the Shore Spurge (*Euphorbia polygonifolia*), growing in the loose barren sand, just as they do near the ocean. Of true marine grasses we find the Sea Sand-reed (*Calamagrostis arenaria*), the graceful Squirrel-tail Grass (*Hordeum jubatum*), and the pest of barefooted boys called Bur-grass or Sand Bur (*Cenchrus tribuloides*), and a rush (*Juncus Balticus*). Our seaside botanist is accustomed to see the Arrow-grass (*Triglochin maritimum*), on every salt marsh. It is likewise common on the marshes a little way back of the lake. In the "basin" near the city flowers a Pond-weed (*Potamogeton pectinatus*). Silver-weed (*Potentilla anserina*), is plenty in the sand, and in some places last season it sent off runners each way full seven feet in length.

We have never seen the Seaside Crowfoot (*Ranunculus cymbalaria*) near the lake shore, but it is very common a little way back on the low pastures and meadows on richer soil. Some of our neighbors tell us that they find the Prickly Pear (*Opuntia vulgaris*) on the bluffs just north of



the city, where it was once much more abundant. The grasses *Calamagrostis longifolia*, Card-grass (*Spartina cynosuroides*), Porcupine-grass (*Stipa spartea*), are common enough and look as though they ought to be dwellers by the sea. We find in the sand beach of the great lakes, Pitcher's Thistle (*Cirsium Pitcheri*), a curious plant which we should look for along the sea beach. It is white, woolly all over, the stem leafy and sprawling, the flowers cream color, and about the size of our common *Cirsium lanceolatum*. The Dwarf, or Sand-cherry, usually trailing six to eighteen inches high, characteristic of true western enterprise, occasionally grows along our shore to the height of eight or ten feet, and has a stem two inches in diameter.

In the walk first proposed one finds thrifty specimens of the Bearberry (*Arctostaphylos Uva-ursi*). Its pinkish white flowers are too pretty to be known by two such long, ugly names, as those given by Adanson and Sprengel. There are now and then tufts of the Early Wild-rose (*Rosa blanda*), abundance of common Milkweed (*Asclepias cornuti*), and *A. obtusifolia*, several Willows and Poplars, Scrub Oak, Shrubby St. John's-wort, Climbing Bitter-sweet (*Celastrus scandens*), Grape-vines, Vetches, False Solomon's Seal, Asters, *Euphorbia corollata*, *Panicum virgatum*, Lead-plant (*Amorpha canescens*), and at the mouth of a brook, its kindred, the False Indigo (*A. fruticosa*), Poison Ivy, and Fragrant Sumach.\*

We have found several specimens of the curious *Aphyllon fasciculatum*, a parasitic ghostly plant of the Broom-Rape Family. In August we find two species of Prairie Clover (*Petalostemon violaceum* and *P. candidum*), the former has been pronounced the belle of Chicago, notwithstanding the want of grace in its straight flower-spike. Back in the ponds flourish the Pond-lilies (*Nymphaea odorata* and *N. tuberosa*), and *Nuphar advena*. The Yellow Nelumbo (*Ne-*

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\* In dry places flourishes a curious Umbellifer, the Rattlesnake-master, or Button-Snake-root, *Eryngium yuccaeifolium*, with leaves like the Yucca, and head and stalk resembling the onions of our gardens.

*lumbium*), has been found in the mouth of Calumet River, ten miles south of Chicago. In the groves are beautiful Violets, Phloxes, *Oxalis violacea*, the unique *Dodecatheon Meadia*; on the marshes Buckbean (*Menyanthes trifoliata*),\* Indian Plantain (*Cacalia tuberosa*), *Valeriana edulis*, and away back on the prairies are hundreds of acres of tall sedges and grasses abounding in several species of *Liatris*, showy Sunflowers, rank Rosin-plants (*Silphium*), and multitudes of Asters and Golden Rods.

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## REVIEWS.

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THE ANDES AND THE AMAZON. †— This racy account of a six months' trip across the continent of South America is really a valuable contribution to American geographical science. The author's "general route was from Guayaquil to Quito, over the Eastern Cordillera, thence over the Western Cordillera, and through the forest on foot to Napo, down the Rio Napo by canoe to Pebas, on the Marañon, and thence by steamer to Pará." This is a new route of travel, and after a trip to the Pacific shores of our own continent, we should prefer this safe, romantic and unfrequented journey to any other we know of. The ascent of the Nile, the great rivers of Asia, and even the Congo itself, are hackneyed subjects compared to scaling the Andes, passing around Chimborazo, and plunging for a long month into the depths of a South American forest, seeking the sources of the Napo River, with that magnificent sail down the Marañon and Amazon to crown all.

As an illustration of the author's pleasant style (though his facts are not always well arranged) we quote his impressions of Chimborazo:—

"Coming up from Peru through the cinchona forests of Loja, and over the barren hills of Assuay, the traveller reaches Rihamba, seated on the threshold of magnificence—like Damascus, an oasis in a sandy plain, but, unlike the Queen of the East, surrounded with a splendid retinue of snowy peaks that look like icebergs floating in a sea of clouds.

On our left is the most sublime spectacle in the New World. It is a majestic pile of snow, its clear outline on the deep blue sky describing the profile of a lion in repose. At noon the vertical sun, and the profusion of light reflected from the glittering surface, will not allow a shadow to be cast on any part, so that you can easily fancy the figure is cut out of a mountain of spotted marble. This is Chimborazo—yet not the whole of it—you see but a third of the great giant. His feet are as eternally green as his head is everlastingly white; but they are far away beneath the bananas and coconut palms of the Pacific coast.

Rousseau was disappointed when he first saw the sea; and the first glimpse of Niagara often fails to meet one's expectations. But Chimborazo is sure of a worshipper the moment its over-

\* *Habenaria Calopogon*, three or four species of *Cypripedium*.

† The Andes and the Amazon: or, Across the Continent of South America. By James Orton. With a new map of Equatorial America and numerous illustrations. New York. Harper and Brothers. 1870. 12mo, pp. 356.

whelming grandeur breaks upon the traveller. You feel that you are in the presence-chamber of the monarch of the Andes. There is sublimity in his kingly look, of which the ocean might be proud.

'All that expands the spirit, yet appals,  
Gathers around this summit, as if to show  
How earth may pierce to heaven, yet leave vain man below.'

It looks lofty from the very first. Now and then an expanse of thin, sky-like vapor, would cut the mountain in twain, and the dome, islanded in the deep blue of the upper regions, seemed to belong more to heaven than to earth. We knew that Chimborazo was more than twice the altitude of Etna. We could almost see the great Humboldt struggling up the mountain's side till he looked like a black speck moving over the mighty white, but giving up in despair four thousand feet below the summit. We see the intrepid Bolívar mounting still higher; but the hero of Spanish-American independence returns a defeated man. Last of all comes the philosophic Boussingault, and attains the prodigious elevation of 19,600 feet—the highest point reached by man without the aid of a balloon; but the dome remains unsullied by his foot. Yet none of these facts increase our admiration. The mountain has a tongue which speaks louder than all mathematical calculations.

There must be something singularly sublime about Chimborazo, for the spectator at Rlo-hamba is already nine thousand feet high, and the mountain is not so elevated above him as Mont Blanc above the vale of Chamouni, when, in reality, that culminating point of Europe would not reach up even to the snow-limit of Chimborazo by two thousand feet.\* It is only while sailing on the Pacific that one sees Chimborazo in its complete proportions. Its very magnitude diminishes the impression of awe and wonder, for the Andes on which it rests are heaved to such a vast altitude above the sea, that the relative elevation of its summit becomes reduced by comparison with the surrounding mountains. Its altitude is 21,320 feet, or forty-five times the height of Strasburg Cathedral; or, to state it otherwise, the fall of one pound from the top of Chimborazo would raise the temperature of water 30°. One fourth of this is perpetually covered with snow, so that its ancient name, Chimpurazu—the mountain of snow—is very appropriate.† It is a stirring thought that this mountain, now mantled with snow, once gleamed with volcanic fires. There is a hot spring on the north side, an immense amount of debris covers the slope below the snow-limit, consisting chiefly of fine-grained, iron-stained trachyte and coarse porphyroid gray trachyte; very rarely a dark vitreous trachyte. Chimborazo is very likely not a solid mountain: trachyte volcanoes are supposed to be full of cavities. Bouguer found it made the plumb-line deviate 7' or 8'.

The valleys which furrow the flank of Chimborazo are in keeping with its colossal sizes. Narrower, but deeper than those of the Alps, the mind swoons and sinks in the effort to comprehend their grim majesty. The mountain appears to have been broken to pieces like so much thin crust, and the strata thrown on their vertical edges, revealing deep, dark chasms, that seem to lead to the confines of the lower world. The deepest valley in Europe, that of the Ordesa in the Pyrenees, is 3,200 feet deep; but here are rents in the side of Chimborazo in which Vesuvius could be put away out of sight. As you look down into the fathomless fissure, you see a white fleck rising out of the gulf, and expanding as it mounts, till the wings of the condor, fifteen feet in spread, glitter in the sun as the proud bird fearlessly wheels over the dizzy chasm, and then, ascending above your head, sails over the dome of Chimborazo.‡ Could the condor speak, what a glowing description could he give of the landscape beneath him when his horizon is a thousand miles in diameter. If

'Twelve fair counties saw the blaze from Malvern's lonely height,'

what must be the panorama from a height fifteen times higher!

\* But Chimborazo is steeper than the Alp-king; and steepness is a quality more quickly appreciated than mere massiveness. 'Mount Blanc (says a writer in "Fraser's Magazine") is scarcely admired, because he is built with a certain regard to stability; but the apparently reckless architecture of the Matterhorn brings the traveller fairly on his knees, with a respect akin to that felt for the leaning tower of Pisa, or the soaring pinnacles of Antwerp.'

† 'White Mountain' is the natural and almost uniform name of the highest mountains in all countries; thus Himalaya, Mont Blanc, Hoenus, Sierra Nevada, Ben Nevis, Snowdon, Lebanon, White Mountains of United States, Chimborazo, and Illimant.

‡ Humboldt's statement that the condor flies higher than Chimborazo has been questioned; but we have seen numbers hovering at least a thousand feet above the summit of Picluncha. Baron Müller, in his ascent of Orizaba, saw two falcons flying at the height of full 18,000 feet; Dr. Hooker found crows and ravens on the Himalayas at 16,500 feet; and flocks of wild geese are said to fly over the peak of Kintschingow, 22,756 feet.

Chimborazo was long supposed to be the tallest mountain on the globe, but its supremacy has been supplanted by Mount Everest in Asia, and Aconcagua in Chile.\* In mountain gloom and glory, however, it still stands unrivaled. The Alps have the avalanche, 'the thunderbolt of snow,' and the glaciers, those icy Niagaras so beautiful and grand. Here they are wanting.† The monarch of the Andes sits motionless in calm serenity and unbroken silence. The silence is absolute and actually oppressive. The road from Guayaquil to Quito crosses Chimborazo at the elevation of 14,000 feet. Save the rush of the trade wind in the afternoon, as it sweeps over the Andes, not a sound is audible; not the hum of an insect, nor the chirp of a bird, nor the roar of the puma, nor the music of running waters. Mid-ocean is never so silent. You can almost hear the globe turning on its axis. There was a time when the monarch deigned to speak, and spoke with a voice of thunder, for the lava on its sides is an evidence of volcanic activity. But ever since the morning stars sang together over man's creation, Chimbo has sat in sullen silence, satisfied to look 'from his throne of clouds o'er half the world.' There is something very suggestive in this silence of Chimborazo. It was once full of noise and fury; it is now a *completed* mountain, and thunders no more."

The author's description of the great crater of Pichincha is alike interesting. The naturalist will enjoy the sketches of animal and vegetable life, and the physical geology and anthropology of the varied tracts passed over. The map we would draw attention to as undoubtedly the best yet published of the region over which the writer passed. It "was drawn with great care after original observations and the surveys of Humboldt and Wisse on the Andes, and of Azevedo, Castlenau, and Bates on the Amazon." Professor Orton was accompanied by four other gentlemen, and the expedition was sent out under the auspices of the Smithsonian Institution. The specimens of rocks, minerals, plants and animals have been submitted to naturalists, who have mostly reported on them, and many facts new to science in these and on meteorological and geographical subjects have been collected and published by the author. The book closes with a chapter telling us how to travel in South America, with hints about the best routes, the expenses, the best outfit, and the precautions and dangers, with a final word on the consolations of travel:

"As to dangers: First, from the people. Traveling is as safe in Ecuador as in New York, and safer than in Missouri. There are no Spanish banditti, though some places, as Chambo, near Riobamba, bear a bad name. It is not wise to tempt a penniless footpad by a show of gold; but no more so in Ecuador than anywhere. We have travelled from Guayaquil to Damascus, but have never had occasion to use a weapon in self-defense; and only once for offence, when we threatened to demolish an Arab sheik with an umbrella. Secondly, from brutes. Some traveller would have us infer that it is impossible to stir in South America without being "affectionately entwined by a serpent, or sprung upon by a jaguar, or bitten by a rattlesnake; jiggers in every sand-heap and scorpions under every stone" ('Edinburgh Review' xliii, 316). Padre Vernazza speaks of meeting a serpent two yards in diameter! But you will be disappointed at the paucity of animal life. We were two months on the Andes (August and September) before we saw a live snake. They are plentiful in the wet season in cacao plantations; but the majority are harmless. Dr. Russell, who particularly studied the reptiles of India, found that out of forty-three species which he examined not more than seven had poisonous fangs; and Sir E. Tennent, after a long residence in Ceylon, declared he had never heard of the death of an European by the bite of a snake. It is true, however, that the number and proportion of venomous species are greater in South America than in any other part of the world; but it is

\* Mount Everest is 29,000 feet, and Aconcagua 23,200. Schlagintweit enumerates thirteen Himalayan summits over 23,000 feet, and forty-six above 20,000. We have little confidence in the estimates of the Bolivian mountains. Chimborazo has nearly the same latitude and altitude as the loftiest peak in Africa, Kilima Njaro.

† Humboldt ascribes the absence of glaciers in the Andes to the extreme steepness of the sides, and the excessive dryness of the air. Dr. Loomis, above quoted, mentions indications of glacial action—moraines, and polished and striated rocks—on the crest of the Cordillera, between Peru and Bolivia, lat. 21° S.

some consolation to know that, zoologically, they are inferior in rank to the harmless ones; 'and certainly,' adds Sidney Smith, 'a snake that feels fourteen or fifteen stone stamping on his tail has little time for reflection, and may be allowed to be poisonous.' If bitten, apply ammonia externally immediately, and take five drops in water internally; it is an almost certain antidote. The discomforts and dangers arising from the animal creation are no greater than one would meet in travelling overland from New York to New Orleans.

Finally, of one thing the tourist in South America may be assured—that dear to him, as it is to us, will be the remembrance of those romantic rides over the Cordilleras amid the wild magnificence of nature, the adventurous walk through the primeval forest, the exciting canoe-life on the Napo, and the long, monotonous sail on the waters of the Great River.\*

SKETCHES OF CREATION.\*—The scope of this book is fully set forth in the rather lengthy title. The aim of the author is an excellent one and just such a work as this is intended to be is much needed, and we welcome every attempt at popularizing the latest facts and theories of science. Our ideal of such works as these are the writings of Hugh Miller, Huxley, Faraday, Gosse, Quatrefages, and others, who, added to the charms of a pure, simple, pellucid style, present the story of creation, or a glance at fragments of it, in a thoroughly artless way.

The author of the book before us we regret to say has too often, in these "Sketches," looked at nature with the eye of a melodramatist, and sometimes we are drawn off from contemplating the grandeur of some scene in nature by an illtimed attempt at wit, or an awkward straining at effect; the flash and thunder savor too much of the explosive mixtures of the theatre. In short, in attempting to be eloquent and lively and *Figuièresque*, the author sometimes becomes grandiloquent, and his diction falls far short of the sprightly style of his French prototype. In spite, however, of these faults of style the book is a very readable one; the facts are correctly stated; the theories presented with much fairness; the illustrations excellent, and if the whole book had been as well and simply written as the chapters on salt and gypsum, and oil, where the learned author is fully at home, our duty as a critic would have almost been a sinecure. As regards his choice of subjects lovers of the sensational and marvellous will find their cravings fully satisfied in the chapters entitled "The Ordeal by Water," "The Ordeal by Fire," The "Solar System in a Blaze," "The Reign of Fire," "The Tooth of Time," "The Reign of Universal Winter," "The Sun Cooling Off," and "The Machinery of the Heavens Running Down." When the author has endeavored, as he seems to think satisfactorily, to settle so many vexed points in the science of our day we wonder that he "refrains from the attempt to lift the veil which conceals the destiny of other firmaments!"

We close with a few special criticisms. The Orthoceratite may have been a very formidable monster to a trilobite's mind, but for the life of us we do not understand how, considering the probable structure of the

\* *Sketches of Creation*: a popular view of some of the grand conclusions of the sciences in reference to the history of matter and of life, together with a statement of the intimations of science respecting the primordial condition and the ultimate destiny of the earth and the solar system. By Alexander Winchell, LL.D. With illustrations. New York. Harper and Brothers. 1870. 12mo, pp. 469.

limbs and its stiff armor and its habits of burrowing in the mud, where corals do not usually live, it could when "alarmed, shoot with a quick stroke of his tail under cover of some coral crag." We should rather imagine this acrobatic feat performed by a lobster. And by the way the author is at fault in allying the trilobite to the Idotean crustacean, *Glyptonotus antarcticus*, figured on page 322, when its closest ally is the Horse Shoe Crab, *Limulus*. Our author adopts the nebulous hypothesis. How can he logically discard a theory of a gradual development of vegetable and animal forms, since the course of nature is apparently the same in both? Why does he reject a fifth subkingdom of the animal kingdom, the Protozoa? The Laurentian Eozoon scarcely conforms to either one of the Cuvierian types, and must form a fifth "corner stone on which Nature has built the superstructure of the animal creation" (p. 315). We would question whether there is not a successional relation between the four subkingdoms of animals, as much as in the classes of the vertebrates.

The best authorities agree that the *Archæopteryx* was a bird, and not a reptile with feathers. Why in figure 98 does our author arm his primeval man with stone axes when attacking the cave bear? Flint, arrow and spear-heads were a "drug" in the Kjoekkenmoedden market. Would not the use of bows and arrows have been better strategy?

We have been informed that Dr. Koch "the reconstructor of the Tertiary Zeuglodon" (see p. 356) is not a man to be trusted in making scientific statements, or reconstructing skeletons of extinct monsters, as his *Hydrarchus* was fully exposed by Johannes Muller, the great comparative anatomist, and shown to have been composed of the bones of mastodons with a sprinkling of Zeuglodon bones.

**HAND-BOOK OF ZOOLOGY.\***—In this little manual the author only claims to give a skeleton of the subject, with illustrations taken from species which the student can collect for himself within the limits of British North America, or can readily obtain access to in public or private collections. Fossil animals are included as well as those which are recent, because many types not represented in our existing fauna, occur as fossils in our rock formations; and because one important use of the teachings of zoology is that it may be made subsidiary to geological research." We like this hand-book, notwithstanding what seem to us great defects in the classification of certain groups, and numerous grave typographical errors, both of which could be remedied in another edition. Teachers will find it (when the second part on Vertebrata is issued) the most available book we have in instructing their classes, when books are relied on in teaching a subject where only specimens and oral instruction ought ordinarily to be used. The first and second chapters, on Physiological Zoology and Zoological Classification contain much sound sense, and de-

\* Handbook of Zoology; with examples from Canadian species, recent and fossil. By J. W. Dawson, LL. D., F. R. S., etc. Part I. Invertebrata, with 275 illustrations. Montreal. 1870. 12mo, pp. 264. Price \$1 50.

serve to be widely read by a class of half educated "species describers" which vex good naturalists the world over.

We regret that the distinguished author includes the Protozoa in the Radiates, for what radiate feature do the Amœbas, Foraminifera, Sponges and Infusoria possess? Why also are the Tunicates, which homologize so closely with the Lamellibranchs, placed between the Polyzoa and Brachiopods?

We are by no means satisfied with the author's treatment of the class of Insects, comprising in his estimation the subclass Hexapoda and Myriapoda. He considers that there are nine orders of six-footed insects (Hexapoda). He retains the "Aptera" as a distinct order, the types being the Lice and Springtails (Podura, etc.). Now the Lice are proved to be low Hemiptera, and the Springtails are closely related to the Neuroptera, if they do not compose a family of that group. The Coleoptera are regarded as the highest, the Hymenoptera being placed below the Neuroptera even! Notwithstanding all we know of the Fleas, they are also consigned to a separate "order," though proven to be a family of diptera. A very objectionable feature to us is the rank assigned to the Spiders, or Arachnids. They are placed as a "class" above the insects. Their mode of development, their want of a true metamorphosis (except in certain genera of Acarina), their morphology — all convince us that they are inferior to the Hexapoda, and do not show class characters, any more than do the Myriapoda. In his definition of the class the author says "antennæ rudimentary or mandibuliform." The antennæ as proved by anatomy and especially embryology (see Claparède's great work on the embryology of the spiders) do not exist in the Arachnids. The so-called antennæ are the mandibles. What are the "tentacles" in this group, the palpi? Of his order Dermophysa, of which we see no necessity, the *Demodex* represents a family of the mites, and the Tardigrades are in all probability the types of another and the lowest family of Acarina, while the Sea Spiders (Pycnogonids) are truly crustaceous, as proved very satisfactorily by the able embryological researches of Dr. Anton Dohrn. The Spiders are to our mind higher than the Scorpions and Phryniidæ.

The cuts are for the most part indifferent, and the printing only endurable, while the typographical errors are so numerous, and in some cases so egregious that we suppose the author did not read the proofs owing to his absence in Europe. In a second edition the shortcomings we have plainly alluded to could be easily corrected, and a cheap, practical, very readable and exceedingly useful manual be produced, and one that would deserve a wide circulation.

A NATURALISTS' GUIDE.\*—This is an excellent little work—one so good, in fact, that we only wish there were more of it. It is difficult, if not im-

\*The Naturalist's Guide in collecting and preserving objects of Natural History, with a complete list of the Birds of Eastern Massachusetts. By C. J. Maynard. With Illustrations by E. L. Weeks. Boston: Fields, Osgood & Co. 1879. (For sale at the Naturalists' Agency. Postage paid \$1.30.)

possible, to give the novice in collecting and taxidermy all the information he requires, in so little space as Mr. Maynard occupies; and in condensing to the utmost, he has left unsaid some things that it would have been advisable to say. If cramped for space the writer might have profitably given up the brief notes upon Reptiles, Fish and the Invertebrates, to make room for more details respecting the taking and preserving of Birds and Mammals—these being evidently his “specialty;” and the loss would not have been great, since the directions regarding the lower animals seem to us too slight and general to be of much real service. Still, attentive study of the book will probably furnish hints and suggestions enough to enable any one to make a good beginning. Regarding the collecting of birds, it gives us much pleasure to observe that Mr. Maynard writes of what he himself knows, and that evidently this is not a little. His notes of the proper times and places to look for birds—of the pleasures and difficulties of taking them—and his pictures of field-work, are true to the life. We have abundant evidence that he has put himself in no danger of tripping by compilation. Thus, for example, his remark upon page 84, “that birds for a certain period increase in size, after which they gradually decrease,” is none the less true because it expresses a fact of which few are aware; and it is one not likely to be found out except by long continued and repeated observation. We endorse the observation without reserve. Most birds are at a maximum size before they are perfectly “adult;” on reaching which state, a certain condensation or compaction of the frame seems to take place, so that they become somewhat smaller. Of this the Bald Eagle is an excellent illustration.

The art of preparing birds for the scientific cabinet, no less than that of mounting them for public exhibition or other popular end, is one acquired only by practice, in gaining which we suppose each taxidermist insensibly grows into ways of his own; so that probably no unvarying rules can be laid down. Mr. Maynard's method is different in many respects from the one we have found preferable; yet we do not wish to call it inferior on this account, the more particularly since we have not the pleasure of being familiar with his work, and are therefore not in position to judge of the real merits of his method—still less of the degree of skill he may have acquired in using it. But we are bound to add, that we see no reason why excellent results should not be obtained by following his directions. The whole matter, after all, hangs upon good taste to begin with, then upon nicety of touch, and finally, upon practice. While we have no difficulty in following out his description of the process he employs, we fear it may be found by the beginner a little obscure at places—or at least, not so full and plain as it might have been made. This brings us back to the thought that prompted our opening sentence; we wish the directions were more ample. Nothing is said, for example, of the first difficulty in skinning—that of separating the feathers properly on the abdomen, and keeping them out of the wound afterwards;



nor of the very next trouble—to avoid attempting to take off the thin abdominal walls with the skin, as beginners almost always do. We are in the habit of directing that the cut be begun a trifle above the lower border of the sternum, since, as nothing but skin can be lifted away there, a guide is found at the outset. We think there is a better way of cleaning off the leg and wing muscles than that the writer advises. We nip off the head of the bone by introducing the closed scissors between the muscles, and opening them just wide enough to grasp the bone; then we strip the muscles from above downward, and snip all the tendons at a single stroke below. Practically, with small birds at least, this is done with the thumb-nail, in an instant. Except in the cases of certain long-winged birds, we do not agree with the author that the humerus should be left in; we remove it, and the radius too, leaving only the ulna, which we separate from both the other bones and all the muscles by cutting its head away from the elbow-joint, stripping the muscle off from above downward, and then removing humerus, radius and all the muscle by a transverse stroke of the scissors just above the carpal joint. A description should have been given of the neat and rapid way of removing the brain and all the head-muscles by the four special cuts that may be made in an instant; instead of the general directions for scooping out and scraping the skull. We think the writer hardly puts the tyro sufficiently on his guard against stretching a skin unduly, particularly at the neck, and so producing that ugly bare space on each side, difficult to rectify afterwards. Except in the cases of large birds, where main strength and awkwardness do well enough, no skin should be pulled, or even drawn, off; but should be *pushed* instead; and as soon as it hangs by the neck, with legs and wings dangling, it should be supported in one hand to prevent stretching. For the “make-up” of a skin more explicit directions would not have been amiss; more than one novice will probably do all that he is here told, and then spoil his specimen. We should like to make a few suggestions regarding this matter, but want of space prevents, as it does our even alluding to a score of little points which will not be found in this or any other book on taxidermy that we have seen, but which are nevertheless very good things to know; and after all, a few hours actual practice under the eye and tongue of a competent taxidermist, will be found more valuable than any treatise upon the subject can possibly be made.

In Part II, Mr. Maynard gives what we find to be a very complete and otherwise excellent list of the birds of Eastern Massachusetts. We do not notice a single species that we would erase, and believe that but very few remain to be added. In the nomenclature of the species he adopts the changes that Dr. Cones has shown to be necessary or advisable in certain families; and in matters specific he is nearly as conservative\* as

\* Thus he does not admit *Turdus Aliciae* Baird, *Troglodytes Americanus* Aud., *Ægiolus exilis* Cones, *Larus Hutchinsii* Rich., and *L. Smithsonianus* Cones. Our *Certhia* and *Eremophila* respectively he refers to the European *C. familiaris* and *E. alpestris*. Whilst our hand is in, we may mention the following cases, all in a single order, where the writer might have con-

Mr. Allen. The notes of habits, etc., are very valuable and useful, and, like Mr. Maynard's directions for collecting, are evidently an original record of the observations of an excellent field naturalist. We have thus the large amount of definite information that is always afforded by good local lists. While we believe that the list gives us no actually new names (its main points, if we recollect rightly, having been already presented in the NATURALIST by Mr. Allen), several of the entries are of special interest and importance. Among these may be mentioned *Centronyx Bairdii*, *Argyria maculata* (accidental), *Xanthocephalus icterocephalus* (accidental), *Tyrannus dominicensis* (accidental), *Passer domestica* (introduced), *Chondestes grammacus* (accidental), *Turdus naevius* (accidental), *Helminthophaga peregrina*, *Falco sacer* (unusually southern), *Strix pratincta* (rarely so northern), *Micropalama himantopus* (rare), *Macrorhamphus scolopaceus*, *Thalasseus aculeatus*, *Pelecanus trachyrhynchus*, and *P. fuscus* (both of these last accidental). The first named Mr. Maynard considers as more likely to be a winter visitor from the north, than a straggler from Nebraska. *Quiscalus major*, *Egialitis Wilsonius*, and a few other species occurring in Allen's or Coues' lists, he dismisses as resting upon insufficient evidence; probably in most instances he is correct in so doing. The supposed *Buteo* "*Cooperi*" turns out to be a state of *B. lineatus*. A good description of the nest and eggs of *Helminthophaga chrysoptera* is given. The plumages of *Scops asio*, and the relationships of *Sterna macrura* and *S. hirundo*, as well as those of *Troglodytes aëdon* and *T. Americanus*, are discussed at some length. In the case of the *Scops* it is evident that ornithologists will not be likely to come to any agreement, until they conclude, as we did long ago, that the variations in the plumage are purely accidental. In an appendix, Mr. Maynard tabulates all the species in convenient form.

We have been so pleasantly impressed with the book, and others will doubtless find it so useful, that we feel the less hesitation in criticising some things in it that we cannot praise. A little care would have prevented such slips as "*carpel*" for *carpal* (p. 20), "*coccygus*" for *coccyx*, or for *os coccygis*, "*arctea*" for *arctica* (p. 152), "*Argyria*" for *Argyria* (p. 164), "*penguin*" for *peregrine* (p. 134), etc. We fear, however, that the writer himself is responsible for such awkward blunders as—"where the humerus joins the sternum" (p. 40); and the mention of the wrists and heels of sheep and deer as "*knee joints*" (p. 49). The figures we cannot speak well of; in fact, they are very bad, and we should judge that they will hardly answer the purpose for which they were designed. Thus we

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sistently questioned specific validity: *Falco anatum*, *Astur atricapillus*, *Pandion Carolinensis*, *Otus Wilsonianus*, *Brachyotus Cassini*, *Nyctale Richardsoni*. There are many others, as nearly allied to European types, that he allows to stand. Though we agree with the writer in being rather inclined toward conservatism, we could wish that, before discussing the grave questions that arise from our varying acceptance of the term "*species*," he had adopted a more lucid and less ungrammatical definition than this: "*Species* consists in a bird's having certain characters so well defined, although inconstant (but never variable beyond a certain point), that it may readily be distinguished from others." (p. 85.)

trust that Fig. 3. Plate VIII, was not taken from an example of the author's handiwork! The book is well printed and handsomely gotten up. We hope it may acquire the popularity to which its merits entitle it.

ORNITHOLOGICAL RESULTS OF THE EXPLORATION OF THE NORTH-WEST.\* This memoir gives the first published results of the Russo-American Telegraph Expedition, organized to explore preparatory to the connection of San Francisco and St. Petersburg by electric telegraph. The officers of the company arranged with the Smithsonian Institution and Chicago Academy, in broad and liberal spirit, for the scientific exploration of the country by a corps of young naturalists headed by Major Robert Kennicott. The party left San Francisco in July, 1865, by several vessels, touching at various points, where collections were made. Starting again, July, 1866, after wintering in San Francisco, Mr. Dall visited Plover Bay, East Siberia, and afterward St. Michael's, Norton Sound, where he learned of Major Kennicott's death, in consequence of which the direction of the scientific corps devolved upon him. Messrs. Pease and Bannister accompanied the remains to San Francisco, while Mr. Dall and his party started for the Unalaklik River and the Yukon, reaching Nulato in December, 1866, and remaining there all winter. In the spring they proceeded to Fort Yukon, and then returned to St. Michael's, where intelligence was received of the termination of the enterprise. Notwithstanding this Mr. Dall decided to finish the scientific reconnaissance of the Yukon River, remaining in the country alone and at his own expense. He proceeded with Eskimos to Unalaklik, where he remained until November, 1867, and in March, 1868, went to St. Michael's, after examination of the country both east and west of Nulato. Crossing the portage in June he descended the Yukon to its mouth, and shortly afterward embarked for San Francisco, from St. Michael's, touching at Pribylof and other islands. The ornithological results thus obtained by Mr. Dall and others, during several years of travel and exploration, are worked up in the paper now under consideration, and in the one we shall presently notice.

We find the memoir to be one of special interest and importance, as was to have been anticipated, no less from the character of its authors and of the other naturalists whose collections contributed towards it, than from the nature of the ground explored, and other fortunate circumstances. It is not too much to say that no single paper has appeared for the last decade, and perhaps for a longer period (although we do not forget the results of Mr. Xantus' explorations), that has added so positively to our knowledge of the geographical distribution and habits of our birds, or that has so largely and at once increased our bird-fauna. In noticing so important a contribution to ornithology we cannot refrain from presenting some of the leading points in detail, although even a bare epitome of all the results obtained would exceed our limits. Before so

\* List of the Birds of Alaska, with Biographical Notes. By W. H. Dall and H. M. Bannister. Trans. Chicago Acad. Sci., Vol. I, Art. ix. 1869.

doing we have only to add, in expressing our sense of the intrinsic value of the paper, and in according all the praise to its authors, that they so justly deserve, our impression that the symmetry of the paper is somewhat marred by the circumstances, unknown to us, which resulted in the preservation of the individuality of the joint-authors; not so much from the recurrence of initials, as from the duplication of some paragraphs and the confliction of a few others.

One important result attained, regarding geographical distribution, is the clear illustration of the western trend of the boundary line of the eastern province as this passes northward; so that several characteristic eastern birds occur in "Russian America," either associated with, or replacing, western species whose occurrence was rather to have been anticipated. The fact has been made more and more apparent, of late years, by other collections from the North-west; and the present one may be regarded as demonstrating it. Thus we have *Picus villosus* and *P. pubescens* instead of *P. Harrisii* and *P. Gairdneri*; *Colaptes auratus* instead of *C. Mexicanus*; *Scolecophagus ferrugineus* instead of *S. cyanocephalus*; *Dendroica coronata* instead of *D. Auduboni*; *Querquedula discors* instead of *Q. cyanoptera*, etc.; with *Seiurus aurocapillus* (though this has lately been known also from the Southern Pacific coast), *Parus atricapillus*, *P. Hudsonicus* ("abundant at Nulato"), *Passerculus savanna* (associated with the three other varieties, or species), *Junco hyemalis*,\* *Passerella iliaca*, *Bonasa umbellus*, *Gambetta flavipes*. The presence of "*Uria lomvia*" (*Lomvia troile*), with both *U. Californica* and *U. arctica* (searbag), is probably rather a matter of circumpolar distribution. We note on the other hand, among absentees that might have been expected, *Zonotrichia leucophrys*, *Limosa fedoa* and *Numenius longirostris*.

Among the names to which American ornithologists have been more or less unaccustomed for the past few years, changes involving questions of specific relationships, and indications of rare or specially interesting species (exclusive of the additional ones to be presently examined), we notice the following points: *Falco sacer* Forster, is used (by Baird) to "indicate provisionally an ash-colored Falcon, with light transverse bars above, found throughout the Anderson River, lower Mackenzie and Yukon region, breeding on trees and cliffs indifferently. It never becomes white, and does not correspond at all with specimens of either *gyrfalco* or *islandicus*." *Buteo "insignatus"* Cass., is given as a variety of *B. Swainsoni*. The old name of *Nyctale "tengmalmi"* replaces *N. Richardsoni*, used of late years; as *Picoides "Americanus"* does *P. hirsutus*, after Sundevall's recent showing (Consp. Av. Picin. 1866, p. 15). The *Saxicola ananthe* we presume to be the same bird that was described and figured by Cassin as *S. "ananthoides"* Vig. (Illust. B. Cal. and Tex., p. 207, pl. 34.). Four species of *Passerculus* are recognized in the list, though we should judge that with the exception perhaps of *P. Sandwichensis*, it were

\* This probably explaining its occurrence, in Washington Territory (*Suckley*), and Arizona (*Coues*).

difficult to tell them apart. *Melospiza rufo* and *Passerella Townsendii* occurred at Sitka. *Corvus caurinus* continues to be recognized as distinct from *C. ossifragus*. The record of *Actodromus Bairdii* is the north-westernmost as yet; with this and Selater's recent South American indication it may be considered as an inhabitant of the western hemisphere at large, though it has yet to be detected in the Atlantic province; this, however, may be predicted with some confidence. *Bernicla* var. *occidentalis* is recognized in two specimens from Sitka, as is also *Pelionetta Trowbridgei*; Mr. Dall remarks that "it is not at all unlikely that *B. Hutchinsii* and *leucopareia* are one species."—The party were enabled to make specially interesting observations on some other water fowl, not only of intrinsic value, but demonstrating over again that many, and probably most birds, however "rare" they may be usually considered through default of specimens or other fortuitous circumstances, yet have their "metropolis" or centre of abundance. We may instance in this connection the observations upon *Chlophaga canagica*, abounding at the mouth of the Yukon, to the exclusion of other species; *Lampronetta Fischeri*, breeding near St. Michael's; and *Somateria v-nigra*, abundant on the north coast. — *Diomedea nigripes* Aud., recently restored by Schlegel and Coues, after being long considered as the young of *D. brachyura*, is stated to be very common in the North Pacific, though not in Bering's Sea. *Larus argentatus* (var.) and *L. brachyrhynchus* are abundant on the Yukon. With the *Rissa tridactyla* "abundant at Sitka and Plover Bay," Mr. Dall has doubtless confounded, since he does not mention, *R. Kotzebui*, a species, or perhaps only a variety, distinguished from *tridactyla* by the remarkable development of the hind toe. *Rissa* "*brevirostris* Brandt" replaces *R. brachyrhynchus*, recognized of late years. The two names undoubtedly refer to the same species; the difference in the color of the legs to which Mr. Dall alludes, is simply a matter of immaturity, or of fading from coral red to yellow in preserved specimens. We do not recollect now which name has priority. *Xema Sabini*, a species highly prized in collections, was found breeding abundantly about Pastolik and St. Michael's, and was not rare at Plover Bay. *Colymbus arcticus* is recorded instead of *C. Pacificus*, which was to have been anticipated; and the same may be said of *Podiceps griseigena* instead of *P. Holboellii*. The "rare" yellow-billed Loon (*Colymbus Adamsii*), only recognized of late years, was got at Kadiak by Bischoff. Among the Auks the most interesting occurrence is that of *Sagmatorrhina Labradoria* Cass. (*S. Lathamii* Bp.), represented by two specimens from Kadiak; these are the first examples of this singular bird that American ornithologists have seen. Bischoff's Kadiak specimens of *Brachyrhamphus Wrangeli* enabled this long obscured species of Brandt's to be restored (Coues, Proc. A. N. S., Phil., 1867, p. 64). The crested *Synthliboramphus unizusume* might have been anticipated; but only *S. antiquus* is recorded.

Not less important than the record of their geographical distribution, of which we have only outlined some of the more salient points, is that of

the habits of the species observed. "Great care has been taken," says Mr. Dall, "in the record of habits; \* \* \* and it is presumed to be generally correct." Of this we have no doubt, and only regret that we must pass by such a mass of information with only this allusion, in recommending it, as we specially do, to the attentive consideration of ornithologists. The accounts of some of the species are very full, and there are few paragraphs that do not fill some gap in our previous knowledge with highly interesting matter.

Mr. Dall includes in the list *Vanellus cristatus*, from a description given him by a hunter of a bird killed on an island off the Golsova River, and which "could apply to no other bird of the country;" no specimens, however, were taken. The other actual additions to our bird-fauna, though of course contained in the present list, are treated of at length in an immediately succeeding paper,\* that presents the pith of the discoveries. Of the sixteen species here described or otherwise noticed, one, *Spermophila badiiiventris* (Lawr., Ann. Lyc. Nat. Hist., N. Y., 1865, p. 172), is Nicaraguan; the others are from the North-west; some are well-known old-world species, new to our fauna; others have been separately described as new by Cassin, Elliot and Coues, of late years; while others still are here presented for the first time. The most interesting of these are doubtless the three that respectively introduce to our fauna as many genera previously known only as old-world. *Pyrrhula* is represented by a variety (*Cassini* Baird) of *coccinea*; "the color of the under parts, if really characteristic of the adult male, will at once distinguish it, in being light cinnamon gray, as in the female *coccinea*, instead of bright nimum red" (p. 316); the single specimen is from Nulato, January 10, 1867. The other two are *Phyllopneustes Kennicottii* Baird (one specimen, St. Michael's), closely allied to *P. trochilus* and *Eversmanni*; and a *Budytes*, which Professor Baird says he is unable to distinguish from the protean *B. flava* of Europe and Asia. It is singular that this last should have been so long overlooked, judging from Mr. Bannister's account. He says (p. 277):—"I first observed this species at St. Michael's about the 9th or 10th of June, and from that until well into the month of August; they were among the most abundant birds, perhaps, after *Plectrophanes lapponicus*, the most abundant of the strictly terrestrial species. During the month of June I observed them generally in flocks of from twenty to thirty individuals."

*Scops Kennicottii* (Elliot, Proc. A. N. S., Phil., 1867, p. 69, and Ill. B. Am. pl. x, one specimen, Sitka), is a large, dark, northern form, close by *S. asio*; probably representing one extreme, of which the small, pale southern *S. McCallii* is the other. *Troglodytes Alascensis* n. s., is a curious species, like *T. hyemalis* in shape and generally similar to it in color, with the size of *T. ædon*; "of its distinctness from any other North American species there can be no question" (p. 315). *Leucosticte griseinucha* Brandt,

\*On Additions to the Bird-fauna of North America, made by the Scientific Corps of the Russo-American Telegraph Expedition. By S. F. Baird.—*Ibid.*, p. 311. (Art. x.)

(Aleutian Islands), noticed in 1858, by Professor Baird, though not formally introduced for want of specimens, is here more definitely characterized; and one *L. littoralis* n. s. (Sitka and Fort Simpson) is described; the latter is considered to be what Elliot figured under the name of *griseinucha* (nec. Brandt), than which species, however, it "is considerably smaller; the colors are brighter and lighter" (p. 318), and the colored areas upon the head are somewhat different. *Melospiza insignis*, n. s. (Kadiak), "is another of the perplexing species allied to the song sparrow of the Eastern United States, and although apparently very distinct \* \* \* is yet traceable into it" (p. 319). *Limosa uropygialis* Gould, auct. (*L. Forsti* Peale), a well-known and extensively distributed old-world species, was found "very common at the Yukon mouth, and on the Pastolik marshes to the north of it" (Dall, l. c., p. 293). *Sterna Aleutica* n. s. (Kadiak), the single specimen of which we have had the pleasure of inspecting, is a remarkable tern, with something of the appearance of *S. arctica*, close to which it must be placed; it has a black bill and feet like *Haliphala*, frontal white lunule like that genus and *Sterna minuta*, etc.; white tail, and body coloration not quite like that of any tern we know of; truly presenting a singular combination. *Graculus bicristatus* (Pallas, Zoog. R. A. ii, 183), is the name conditionally applied by Professor Baird to a bird from Kadiak, which he identifies with much hesitation. As is well-known, the cormorants are in a confused state at present, and will require thorough revision before the perplexity now attending their determination can be removed. *Puffinus tenuirostris* (Temm., Pl. Col. No. 587) is a well-known shearwater from Japan, etc., now introduced from Kotzebue Sound (Dall); Schlegel has it from Sitka. *Fulmarus Rodgersi* (Cassin, Pr. A. N. S., Phil., 1862, 290, and Coues, ibid., 1866, p. 29), first described, as just quoted, from the "North Pacific," was taken at St. George's Island, Mr. Dall's specimen making the first discovered since the type; it is chiefly distinguished from *F. glacialis* by the white on the inner remiges. The fifteenth species is *Larus borealis* Brandt, which Professor Baird very truly says "is hardly to be called a species." We doubt the propriety of recognizing it, since it is nearly *L. Smithsonianus* with a slightly darker mantle; further south on the Pacific coast *L. Smithsonianus* is not distinguishable in any respect from the common bird of the Atlantic states; and while *L. "borealis"* may be said to form the connecting link, in respect of the color of the mantle, between this and the Californian *L. occidentalis* Aud., it appears to lack the great depth of bill which is a strong character of the latter. The last species that Professor Baird gives is the *Simorhynchus Cassini* (Coues, Pr. A. N. S., 1868, p. 45), from Oonimak Pass; a species near *S. tetracladus*, but much less in size, with a remarkably small, simple bill, and dusky, leaden colored plumage.

In closing a rapid analysis of these two very interesting and important memoirs, we have only to add further, that they are accompanied by a number of colored plates, well illustrating all the new species, and the other additions to our fauna.

GEOLGY OF INDIANA.\*—This survey has evidently begun in earnest. The present volume informs us that it is instituted to make known the mineral resources of the State, but does not state the amounts appropriated; we hope, however, it is proportionate to the practical benefits already conferred by the Survey. The geology of the counties examined, Clay, Greene, Park, Fountain, Warren, Vermillion and Franklin, display rich fields of coal, and are full of practical details which seem to have already more than tenfold repaid the expenses incurred. From Greencastle to Terre Haute a section has been run along the railroad line and by means of two Artesian wells the strata sounded to a considerable depth. These have enabled the Survey to give a very interesting section showing the strata from the Silurian to the surface. The first one at Terre Haute penetrates first the glacial deposits and reaches to the depth of one thousand seven hundred and ninety-three feet, stopping in the subcarboniferous rocks; the second at Reelsville, begins where the subcarboniferous limestone comes to the surface farther east, and though bored only one thousand two hundred and forty feet, penetrated the Upper Silurian.

The present report is concluded with a catalogue of the Mammals and Birds of Franklin County.

The assistants engaged in the Survey are Professor F. Bradley, Dr. Rufus Haymond, and Dr. G. M. Levette. The two former contribute largely to this volume; the report of the first on Vermillion county being particularly full and complete. We hope that no short-sighted economy will cut this survey short as that of Iowa has been before it has thoroughly worked up the natural history of the State.

RUDOLPH'S ATLAS OF THE GEOGRAPHY OF PLANTS.—There is, as I understand, an "Atlas der Pflanzen geographie," by L. Rudolph, of which a second edition has been published in Berlin, and recommended for translation into English, and introduction into our high schools. I possess the first edition, but I do not know whether the new one is as worthless as the first one is. If this is the case I do not understand how such a product of the utmost ignorance could be recommended, though the great Humboldt, to whom the work is dedicated, had already puffed it, probably without ever having looked at it. To prove my assertion I will point out the following errors in plate "North America" of the first edition. Between 34° and 45° north latitude in Oregon and California we find sixteen plants mentioned, of which not a single one grows there, *i. e.*, *Rudbeckia pinnata*, *Fraxinus Americana*, *Aristolochia siphon*, *Smilax sarsaparilla*, *Quercus tinctoria*, *Q. castanea*, *Ampelopsis bipinnata*, all eastern species; *Tagetes patula*, *Tagetes erecta*, *Lobelia splendens* and *fulgens*, *Georgina variabilis*, *Coclea scandens*, *Convolvulus Mechoacana* (Mexican species), *Smilax officinalis* (Mexican when of Presl, South American when the plant

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\* First Annual Report of the Geological Survey of Indiana. By E. T. Cox, State Geologist. 8vo. pp. 240, with two maps and one section.



of Humboldt and Bonpland is meant) *Fraxinus heterophylla*, a European tree! The *Vanilla*, *Cacao* and *Quinoa* cultivated in the desert west of the Colorado! *Zinnia elegans*, *Georgina coccinea*, *Ipomea purga* are all placed too far northward. *Robinia viscosa* and *hispida* between the upper Missouri and Rocky Mountains, with *Gleditschia monosperma* and *G. triacanthos* in Northern Wisconsin; *Rosa suavis* and *Americana*, quite unknown species; *Pinus palustris* on McKenzie River!! *Pinus occidentalis* from West Indies, transplanted to the North American continent; *Juglans oliviformis*, our Pecan and *Castanea pumila* in the Rocky Mountains, and *Kalmia cuneata* on the Red River; *Aristolochia officinalis* (probably *Serpentaria*), *Bignonia capreolata* in Michigan; *Diospyros Lotus* an European tree; almonds and figs cultivated near Lake Ontario! And so on! Should all these errors be reproduced in the second edition, the introduction of the work into our schools will be a great nuisance. — F. BRENDL.

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## NATURAL HISTORY MISCELLANY.

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### BOTANY.

DIALYSIS WITH STAMINODY IN *KALMIA LATIFOLIA*. — These two technical words we take from Dr. Masters' interesting volume published last year by the Ray Society, entitled "Vegetable Teratology," which last word denotes the science of monstrosities. *Dialysis* is the term applied to the separation of parts which are normally united; *staminody* is the conversion of other organs into stamens.

We have before us a novel and specially interesting monstrosity which is described by these terms. It was discovered by Miss Bryant, at South Deerfield in this state, and we are indebted to her, through a common friend, for the specimens before us. Among the shrubs of *Kalmia latifolia* which abound in a swamp belonging to Col. Bryant, a few have been noticed as producing, year after year, blossoms in singular contrast to the ordinary ones of this most ornamental shrub, and which, indeed, are more curious than beautiful. The corolla, instead of the saucer-shaped and barely 5-lobed cup, is divided completely into five narrowly linear or even thread-shaped petals. These are flat at the base, and scarcely if at all broader than the lobes of the calyx with which they alternate, but above by the revolution of the margins they become almost thread-shaped, and so resemble filaments. This resemblance to stamens goes further; for most of them are actually tipped with an imperfect anther; that is, the corolla is separated into its five component petals, and these transformed into stamens. Altered as they are in shape, yet a trace of the pouch is often discernible, in the form of a little boss on the outer or lower side, and a slight corresponding depression on the upper. The anther is ex-

trorse and adnate, usually subapical rather than strictly terminal, and its two cells incline to open lengthwise. The ten proper stamens are just as in the normal flower, except that they are erect or at length recurved, and the anthers wholly free, there being no pouches to receive them. The pistil is wholly normal, and there is nothing apparent to prevent the ovules from being fertilized and maturing seed. — A. GRAY.

OCCURRENCE OF RARE PLANTS IN ILLINOIS. — There are in "Gray's Manual" some species noted as rare which grow in the vicinity of Peoria: *Silene nivea* DC., *Napaea dioica* L., *Polygala incarnata* L., *Cacalia suaveolens* L., *Asclepias Meadii* A. Gr., *Pogonia pendula* Ldl., *Liparis Loeselii* Rich., *Aplectrum hyemale* Nutt., *Panicum autumnale* Bosc., *Zannichellia palustris* L., in great abundance; and in St. Clair county, *Eleocharis quadrangulata* R. Br.

There are a number of species which could, from the habitats given in "Gray's Manual," be taken as not growing in Illinois, though they do; they are *Arenaria lateriflora* L., *Flækea proserpinacoides* Willd., *Agri-monium parviflora* Ait., *Archangelica atropurpurea* Hoffm., *Lonicera flava* Sims, *Aster æstivus* Alt., *Solidago neglecta* T. Gr., *Gnaphalium purpureum* L. (only one found), *Troximon cuspidatum* Ph. (noted as reaching to North Illinois), *Arctostaphylos uva-ursi* Spr., *Lysimachia thyrsiflora* L., *Utricularia intermedia* Hayne, *Phlox reptans* Michx. (?), *Frazinus sambucifolia* Lam., *Aristolochia serpentaria* L., *Dirca palustris* L., *Carya tomentosa* Nutt., *Salix myrtilloides* L., *Orchis spectabilis* L., *Trillium nivale* Ridd., *Triglochin maritimum* L., *Potamogeton pectinatum* L., *Allium tricoccum* Ait., *Carex arida* Schw. Torr., *C. filiformis* L., *C. lanuginosa* Michx., *C. longirostris* Torr., *Equisetum variegatum* Schleich., *Asplenium angustifolium* Michx., occur around Peoria.

I have seen *Arabis lyrata* L., on the limestone rocks near Galena, and *Collinsia verna* Nutt., in Fulton county. In Southern Illinois I have collected *Vitis indivisa* Willd., *V. bipinnata* T. Gr., *Heuchera villosa* Michx., *Fedia radiata* Michx., *Celtis Mississippiensis* (near Cairo) *Quercus phellos* L., *Cyperus virens* Michx., *Paspalum Walterianum* Schult., *P. læve* Michx., *Campylosorus rhizophyllus* Link (at Falling Spring, opposite St. Louis). — F. BRENDEN.

## ZOOLOGY.

EARLY ARRIVAL OF GEESE. — A flock of forty geese (*Anser Canadensis*) were observed passing over Glace Bay, Cape Breton, steering north on the 23d of February. This is at least a fortnight earlier than I have ever known them to appear in Nova Scotia. — J. MATTHEW JONES, *Halifax, N. S.*

HYBRID FOWLS. — In answer to a query in the *NATURALIST* for March, as to the hybridation of Pintados, I might state that an instance of the kind alluded to came under my notice in the year 1845, where the cross was the more singular one of a male turkey and a female Guinea hen.

There were upwards of twenty eggs laid by the hen, and incubation had progressed until within about two days of hatching, when a marauding opossum found the nest and destroyed all but two of the eggs. These were hatched, and grew to maturity, evincing a singular combination of the form and habits of their incongruous parentage.

The birds were forwarded to the Academy of Natural Sciences of Philadelphia, where their skins were mounted, and I believe are still to be seen. I forwarded an account to the Academy at the time, and they were made the subject of a report by the late Dr. Morton. I have not the Proceedings of the Academy by me, but I believe the account will be found in the volume for 1846.

The Guineas are very strong in their attachments, and the old gobbler had to do the agreeable to his wife and children all summer whether he would or no. — WILLIAM KITE.

We have at the Central Park a pair of hybrid fowls, which I consider as a cross between the common and Guinea fowl. They are large boned; have the cackel but not the horny casque and wattles of the Guinea fowl. Instead of the feathers being speckled they are marked with fine wavy lines. Tegetmeier says the hybrids between these fowls are rare but when produced are perfectly sterile, being incapable of reproduction between themselves or with either of the species from which they were derived. — WILLIAM A. CONKLIN.

In answer to a query in the NATURALIST of March, I would say that there was a fowl in St. Augustine of this state, that was a cross between the dung-hill fowl and Guinea hen. I have heard of two other instances, but have no positive proof, except in this one instance. — C. H. NAUMAN.

HYBRID RABBIT. — On the 13th of October a rabbit was shot in the woods in this vicinity, which the most superficial observers readily decide to be a hybrid between our common wild rabbit and the English domesticated species. Both are common here; the former in a wild state, the latter in coops and pens, from which they often escape to the adjacent woods. In this individual the characters of the two are so equally blended as to leave no doubt as to its parentage. It is well mounted in my cabinet. — J. P. KIRKLAND.

TURKEY BUZZARD. — Can a Turkey Buzzard be deceived by his sense of smell? I have noticed several instances in which skunks have been eaten by buzzards within a few hours after they were killed; and in all cases the creature had given out a great amount of his odor; those which were odorless being allowed to lie as long as other animals. Did the buzzards mistake the skunk's scent for putrefaction? — J. L. B., *Colona, Md.*

DOUBLE HEADED SNAKES. — Within the last ten years I have had in my possession two specimens of doubled headed Snakes. One was accidentally lost, the other is before me, preserved in alcohol. The latter lived some weeks after it was captured and would sustain itself on flies which it seized with one of its mouths; the other seemed always to be passive

and of no use. Both specimens were the young of our Water Snake, *Regina leberis* of B. and G. — W. KIRKLAND.

REPRODUCTIONS OF LIMBS. — M. Phileppeaux has proved for fish what he had already demonstrated in the case of newts, *viz.*: that when the limb is removed below the scapula or ilium it is reproduced. But when the scapula or ilium is removed no reproduction takes place. — *Monthly Microscopical Journal*.

DOES THE PRAIRIE DOG REQUIRE ANY WATER? — The following may throw some light on the question. October 26th, 1869, I received two prairie dogs from Cheyenne. The dogs were kept in my laboratory under my own eye, and I am *sure* have drank no water from that time to the present, nearly six months. March 11th and April 3d I placed a dish of water before them. Each time they merely smelt of it, and turned away without drinking a drop. They were fed on nuts, corn, apples, cabbage leaves, celery tops, etc. During the months of December, January and February, they were taking their winter nap, and of course ate nothing. B. C. JILLSON, M. D., *Pittsburgh, Pa.*

AN ALBINO TURKEY BUZZARD (*Cathartes aura* Illig) was shot near here about a month since, and a white black duck (*Anas obscura* Gm.), was seen a few days ago. — CHARLES H. NAUMAN, *Smyrna, Fla.*

ALBINO SNOW BIRD. — November 16th last, I shot an albino snow bird, *Niptea hyemalis*. The bird was with a flock of its species, and attracted my attention by its singular whiteness. It is a male, and possessed no peculiarity that I have discovered except its plumage, which was chiefly snow-white. — WILLIAM P. ALCOTT, *North Greenwich, Conn.*

ALBINO RATS. — Colonies of albino rats are becoming quite common in the city of Cleveland and its suburbs. I have a live specimen caged, which if freed from its odor, would form an interesting pet. Its fur and hair are pure white, and its eyes pink colored. No squirrel could be more active and playful. Much of its time is spent in washing its face and smoothing down its coat of hair and fur.

THE LITTLE STRIPED SKUNK IN CENTRAL IOWA. — An animal of this beautiful species was killed in this town (Grinnell, Iowa), February 12th, and brought to me to be stuffed for the College cabinet. It has been considered a Texas and California species, but I am informed by Professor Baird that it has been found as far north as Neosho Falls, Kansas; also that he regards the markings as distinctive of the species. My specimen is not much larger than a Western Fox Squirrel. It has all the characters of *Mephitis bicolor* Gray, as described in Baird's "General Report." — H. W. PARKER, *Grinnell, Iowa*.

THE RUBY CROWNED KINGLET. — In regard to the query of Mr. Allen about the ruby crowned kinglet, I would say that I obtained ten or twelve specimens in May and June on the Yukon River, Alaska, all of which had the red crown, and proved on examination to be males. I never saw a

female of this species in that region, and noted the fact as remarkable at the time.

I notice among the notes in regard to the Massachusetts ducks, the statement that the mallard pintail and black duck do not dive for their food. My own observations do not entirely confirm this theory. The black duck is most common on the lagoons in the low ground of the Yukon marshes, and, with others, feeds principally on the roots of the *Equisetæ*, which in the spring are under water from six inches to two feet, until the river falls and leaves them dry, or nearly so. I cannot say that I have seen them dive often, but I have certainly done so on one or two occasions. This species was not found on the sea-coasts of that region.

The pintail is very common on both coast and river, and I have seen them dive apparently for food, hundreds of times. Indeed, they are extremely expert at it, and are only excelled by the true sea ducks, such as the old squaw. The same is true of the mallard, which is more common on the deeper lagoons and on the coasts, than on the shallows by the river, according to my observations. It is, however, not impossible that their habits may vary somewhat in different localities. — W. H. DALL.

THE MARSH HARRIER. — About all our meadows and wherever mice are numerous this beautiful species is very abundant. During the past and present month we have seen, we believe, at least a hundred of them, *all females*. Where are the pale blue gray male birds? We have yet to see the first specimen this year. We have never seen a dozen in as many years. Is this absence of male harriers as noticeable elsewhere? Have others called attention to it? This species, *Circus Hudsonius*, nidificates in this state, yet even in the neighborhoods of the nests, we have been unable to find the male bird. We have noticed this hawk lately engaged in tearing open the ridges formed by the burrowing of the mole (*Scalops aquaticus*), and once saw the bird overtake and kill the beast, but it would or did not devour it. Will any hawk eat so offensively smelling an animal as this *Scalops* is? — CHARLES C. ABBOTT, M.D.

NIGHT HERONS. — During the past four months a yard within city limits, in Trenton, N. J., bordering on the river, and having considerable left it of undisturbed nature, has presented a feature of interest, in the daily presence of a male, female and three young night herons (*Nycticorax nycticorax*). This bird is common with us during the summer, but not about the usual thoroughfares, or even by-ways of the people. They breed in unfrequented swampy localities exclusively, when with us. Stragglers are occasionally met with about springs in mid-winter, but never before, as in this case, in town. The little colony mentioned remain during the day in the large pines in the yard, seldom moving about until sundown, when they visit the little pond, and spring brook in the grounds, which, in consequence of the mild winter, have remained comparatively warm, and the vegetation about them green. In this pond the

frogs have been as active and abundant as during the summer, which fact we suppose has been the principal cause of the continued presence of the herons. On these frogs and the many gold-fish, these birds have subsisted daily since early in November. Occasionally they have visited the river shore, but not from the river have they apparently secured any important quantity of food. These five birds are probably a family raised in the neighborhood, and must have remained together during the early autumn, which is an unusual proceeding. It will be of interest to watch their farther movements to see if, during the coming summer, they will be as indifferent to the proximity of man, and if next winter they will also remain in a yard in town. — DR. CHARLES C. ABBOTT.

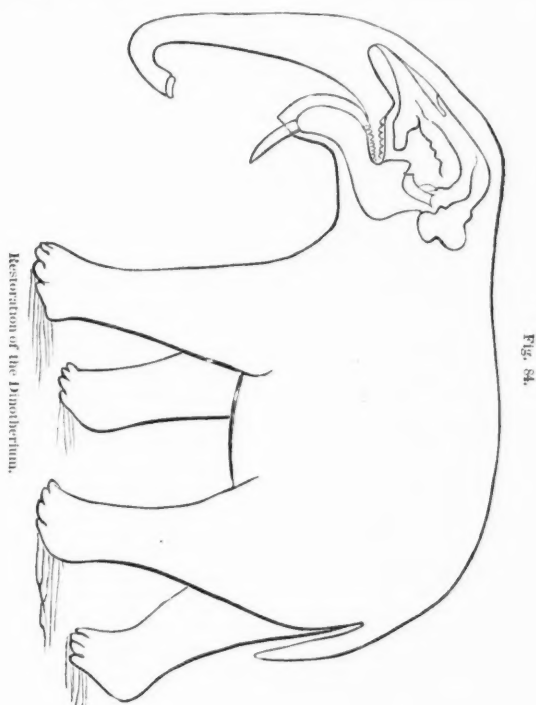
SONG OF THE SONG-SPARROW. — Throughout the winter, and at this time (April 11th), we are having with us a great abundance of sparrows, especially the one above mentioned (*Melospiza melodia*). While their numbers have been generally noticed and commented upon, there has been one other feature connected with them, that to an ornithologist is interesting and equally noticeable, *i. e.* a marked change of notes or song. In fact, this change induced me to think, at first, that the new notes were those of another bird; but a careful examination has shown the birds of the new and old song, to be one and the same. We have seen as well as heard the same bird warble first the old time song and follow immediately with the new notes. Giving, as the best illustration of their old song, *Pres-pres-pres—Pres-by-tee-rian*; we can best show the variation by describing the new as *Fee-o, Fee-o, twit-ta, twit-ta, twit-ta, fee!* Hearing these notes, at first, in the one locality (Trenton, N. J.), we thought possibly they might have been uttered by but one individual; but since, we have shown this not to be the case, by finding the same variations of song, in various and widely separated localities. Is such a change of notes a common occurrence, in a species having so uniform a song as this species is known or supposed to have? — CHARLES C. ABBOTT, M. D.

## GEOLOGY.

GEOLOGICAL EXPLORATIONS. — Professor C. F. Hartt of Cornell University, with his associate, Professor A. N. Prentiss, and nine assistants, sailed June 23 for Brazil, to study the geology of north-eastern Brazil and the right bank of the Amazon. Another aim of the expedition is to explore the coast from Para down to Pernambuco, and investigate the coral reefs of this part of the coast.

About the same date Professor O. C. Marsh, of Yale College led an expedition, composed of students and recent graduates, to the Rocky Mountains, where he will spend several months and collect the vertebrate fossils of Nebraska, Dakota, and Wyoming. The party will then go to California, and visit some of the principal geological localities on the Pacific coast, after which they will return through Colorado and Kansas, reaching New Haven probably in November.

RESTORATION OF THE DINOTHERIUM. — I enclose an outline restoration of the Dinotherium, that I found lately among the St. Petersburg Transactions, presenting the latest ideas of Dr. Brandt in regard to that animal. — S. F. BAIRD.



### MICROSCOPY.

DEVELOPMENT OF GAS IN PROTOPLASM. — Dr. Th. Engelmann has observed in *Arcella*, a minute protozoon like an *Amoeba* with a shell, a periodical development of gas. Dr. Engelmann made his observations on specimens confined in a gas chamber, and describes minutely how gradually in the protoplasmic hyaline substance of the animalcule, black points arise, which as gradually coalesce, forming a distinct air bubble. This gas can after a time be absorbed again, and reasons are given for believing that a sort of volition is exercised by the *Arcelle* in the secretion and

absorption of the gas which they use in the manner of a float or air-bladder. The air-bubbles are not connected with the contractile vacuoles, or with the nuclei. The air-bubbles it is important to observe, do not occur in the non-granular protoplasm of the pseudopodia, but in the granular substance, and are not spherical but of an irregular form, which as Dr. Engelmann observes, proves that the protoplasm is not in the condition of aggregation of a fluid. The chemical composition of the gas thus so remarkably developed by the *Arcelle* was not determined, nor the mechanism (if any exist) of the formation and disappearance of the air-bubbles. The discovery is of importance from two points of view: in the first place, for the development of gas in protoplasm as a physiological phenomenon; in the second place, for the supposed voluntary nature of this development, of which this exceedingly simple organism makes use for the purpose of locomotion.—*Quarterly Journal of Science*.

THE LARGEST INFUSORIUM KNOWN. — In the "Institut" of the 24th of January is an interesting paper on the Gregarinadæ, which are well known to represent one of the simplest forms of animal life, consisting of a nucleated cell, which under certain conditions invests itself with a transparent membrane, becoming, as it is termed, incysted. The nucleus disappears and the substance of the body then breaks up into innumerable sporosperms, navicellæ, or elongated minute corpuscles, which, being set free by the bursting of the enclosing capsule, become distributed in the various organs of many animals. A well-marked form is found in the alimentary canal of the common beetle. M. Edouard v. Beneden has lately discovered a remarkable form, to which he has applied the name *Gregarina gigantea*, in the intestine of the lobster. It has been subjected to MM. Gluge and Schwann of the Académie Royale de Belgique for examination, and they report that its length is no less than 16 mm., and its breadth 15 mm., or nearly two-thirds of an inch. It presents, in the membrane which forms its wall, a contractile layer, to which M. Beneden had previously called attention in other species. The interior of the animal is occupied by a viscous liquid containing granular particles, with a nucleus and nucleolus. This last exhibits a remarkable phenomenon. At first it is single, but in the course of a few seconds the nucleus appears to be filled with a large number of small refractile corpuscles, which are so many nucleoli. Some of them then augment considerably in size, whilst the primary nucleolus gradually disappears. With the exception of the yolk of the egg of birds, and some other animals, the *Gregarina gigantea* constitutes the largest known cell. — *The Academy*.

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#### ANTHROPOLOGY.

ABORIGINAL RELIC FROM TRENTON, NEW JERSEY. — In the "Proceedings of the Academy of Natural Sciences of Philadelphia," and in local papers, we have frequently called attention to various large deposits of arrowheads, axes, etc., and to interesting isolated specimens of curi-



ously shaped relics, found in and near this city. We now call attention to the relic figured here as one that is unique, at least so far as New Jersey is concerned. About four and a half inches long it is very accurately sloped to the back, which is a flat ridge, uniformly one-thirty-second of an inch in width, from the neck to the posterior end, which curving upward, is about double that thickness on the edge. The head of the stone is oval, accurately cut, with a width in the centre of three-sixteenths of an inch. The knob-like protuberances, stand out from the head one-third of an inch, and have a narrow neck, about one-half the width of the head of the protuberance, as seen in the illustration (Fig. 85). The bottom, as the drawing shows, is flat.

Fig. 85.



At either end is a hole drilled; in the front the hole is about a quarter of an inch from the end and drilled obliquely, until it meets the drilling from the neck, which is bored at a similar angle to the neck, as the under one is to the base. The holes at the posterior end are similarly bored. The material is hornblend.

If the stone is meant for a representation of some animal the holes would seem to be intended for the insertion of legs; but probably were used to insert a string or sinew, that the figure might be carried about the neck. We have never seen any large collection of these "Indian" relics, and do not know whether it is a common form elsewhere or not, but, as we previously stated, it is novel to New Jersey. It was ploughed up near the city, in a neighborhood where only axes and arrow points are to be met with, and those not abundantly. — CHARLES C. ABBOTT, M.D.

ORIGIN OF THE TASMANIANS. — Mr. Bonwick, in a recent paper "On the Origin of the Tasmanians, geologically considered," states that the Tasmanians have now become almost extinct, an old woman being the only survivor of the race. They were related in manners and in general *physique* to the neighboring Australians, but were allied by black skin and woolly hair to the distant Africans, while they were assimilated by resemblance of language, customs, and habits of thought, to many races scattered over vast areas. The author seeks to explain this relation by constructing an ideal southern continent, whence all the dark-colored races surrounding the Indian Ocean, and extending into the Pacific and southern oceans may have radiated. He regards the Tasmanian as probably older than the Australian. Dr. Hooker, whose authority had frequently been quoted in the paper, pointed out the similarity and differences that obtain between the floras of Australia, Tasmania, New Zealand, South Africa, etc. It has recently been found that the flora of the Howe Islands is very unlike that of Australia, although so near to the coast. He protested, however, against the inference that the line of migration followed

by plants is necessarily the same as that pursued by the higher animals. The president alluded to the great difference between the Australian and Tasmanian, especially in the character of the hair; and he regarded it as physically impossible that the Tasmanian could have come from Australia. He suggested that an interrupted communication by a chain of islands may have extended from New Caledonia to Tasmania, similar to that which now connects New Caledonia with New Guinea; and that by this means a low negro type may have spread eastward over this area. — *Scientific Opinion*.

STONE IMAGES ON EASTER ISLAND. — A paper was read by Mr. J. L. Palmer, R. N., on a recent visit to Easter Island in H.M.S. *Topaz*. During the visit the singular colossal stone images which excited the astonishment of Captain Cook and the earlier voyagers were accurately observed and measured, and a specimen of them brought away to deposit in the British Museum. Mr. Palmer described the topography of this remote island in the South Pacific. It is only twelve miles in length by four in width, and lies in a part of the ocean far away from other islands, at a distance of two thousand miles from the coast of South America, and one thousand miles from the nearest Polynesian islands to the west. The island is entirely a volcanic formation, and presents numerous extinct craters, one of which yields the gray lava of which all the stone images are made, and another the red tufa from which are carved the crowns or hats that formerly rested on their heads. The present inhabitants are only nine hundred in number — a good-looking, pleasant-tempered, set of people. They belong to the Polynesian race, and have a tradition of their immigrating from Opara at no very distant period. The interest attaching to the island was an ethnological one, and concerned the race who sculptured the vast quantity of stone images now existing *in situ* on stone platforms in various parts of the island, or inside large stone chambers or houses. The platforms, chambers, sculptures, and mural paintings were described by the author with minuteness, but he did not propound any theory as to their origin. He stated that the inhabitants knew nothing of the matter, that they were undoubtedly of great antiquity, and that it was probable they were executed by a race who had long since passed away.

In the discussion which followed Mr. Markham mentioned the fact of similar images having been found by the early Spanish invaders in the cities on the banks of Lake Titicaca, in South Peru, and belonging to the Aymara nation. There existed, however, this difference — that the Aymara images were profusely sculptured. Recently a stone platform had been found in one of the Pacific Islands, one thousand miles to the west of Easter Island, at the bottom of a deep deposit of guano, and he threw out the suggestion that these were all relics of a very ancient people who slowly migrated across the Pacific from west to east. Mr. Franks gave in detail his reasons for concluding that the ancient remains

in Easter Island truly belonged to an earlier population of the same Polynesian race who now inhabit the island. Sir George Gray also expressed the same opinion, and spoke of the habit of carving images as being a peculiarity of Polynesians, including the Maories, and that in a place where wood (the usual material) was very scarce, as it is in Easter Island, it was natural that stone should be substituted. Mr. Palmer gave some farther details of the amiability and good conduct of the present inhabitants, who had been much improved by the Roman Catholic missionaries. Mr. P. P. Blyth also took part in the discussion, and the president, in summing up, mentioned the soft nature of the volcanic rock of which the images were made as supporting Sir George Gray's explanation. — *Scientific Opinion*.

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. — The meeting of the Association for 1870 will be held at Troy, N. Y., beginning on Wednesday, August 17th, having been postponed by the Standing Committee from the 3d, at the request of the Local Committee. We believe from the general expressions last year at Salem that this next meeting will be largely attended and will prove a most interesting one. The Local Committee is evidently doing all it can to make the meeting a success; and judging from the character of the gentlemen composing the Committee, its large size, and careful division into sub-committees on Receptions, Finance, Lodgings, Excursions, Rooms, Invitations, Printing and Railroads, we feel confident that the Association will be most cordially received and taken care of during the session.

We trust that the subsections of *Archæology* and *Ethnology*, and of *Microscopy*, organized at the Salem meeting, will be reorganized with a large attendance in these interesting departments.

The following are the Officers of the Meeting: — William Chauvenet, St. Louis, *President*; T. S. Hunt, Montreal, *Vice-President*; Joseph Lovering, Cambridge, *Permanent Secretary*; C. F. Hartt, Ithaca, *General Secretary*; A. L. Elwyn, Philadelphia, *Treasurer*.

*Standing Committee*. — William Chauvenet, T. S. Hunt, Joseph Lovering, C. F. Hartt, J. W. Foster, O. N. Rood, O. C. Marsh, A. L. Elwyn.

*Local Committee*. — John A. Griswold, *Chairman*; George C. Burdett, *First Vice-Chairman*; P. V. Hagner, *Second Vice-Chairman*; Benjamin H. Hall, *General Secretary*; H. B. Nason, *Corresponding Secretary*; Adam R. Smith, *Treasurer*, and seventy-seven others.

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#### ANSWERS TO CORRESPONDENTS.

C. J. C. The plant found in flower June 21, on Mount Monadnock, is the *Arenaria Grœnlandica*. It is abundant on the summit of Mount Washington, and we have found it common at Hopedale, Labrador, where it grows near the shore of the ocean.

## BOOKS RECEIVED.

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*Reviewers of Report on Invertebrata of Massachusetts, and of Molluscan Fauna of New Haven.*  
 By A. E. Verrill. [From Am. Jour. Sci. Arts. May, 1870.]  
*Valedictory Address, Jefferson Medical College.* By J. A. Meigs, M. D. Philadelphia, 1870.  
*Ueber die Mikroskope Nordamerikas, von Dr. H. Hagen.* Pamph., 8vo. 1870.  
*The Elevation of Mountains.* By C. H. Hitchcock. 8vo. pamph., April, 1870.  
*Tidskrift for Populære Frensstillinger af Naturvidenskaben.* 1870. Kjøbenhavn.  
*American Entomologist and Botanist.* Vol. II. Nos. 7-8. May, June, 1870.  
*New York State Library.* Fifty-second Annual Report of Trustees.  
*Peabody Institute.* Eighteenth Annual Report of Trustees. Peabody, 1870.  
*American Journal of Medical Sciences.* No. 118. April, 1870. [Quarterly, \$5.00.] Philad.  
*Cosmos.* From January 1 to June 25, 1870. Paris. [Weekly.]  
*Monthly Report of Department of Agriculture.* March, May, 1870.  
*Annual Report of Sec'y Massachusetts Board of Agriculture for 1869.* 1 vol., 8vo. Boston, 1870.  
*American Journal of Conchology.* Vol. v. Part 4. Philadelphia. [\$10 a year.]  
*First Annual Report of the American Museum of Natural History.* January, 1870. New York.  
*Notes on Fresh-water Fishes of New Jersey.* By C. C. Abbott, M. D. [From American Naturalist, April, 1870.]  
*Bulletin of the Torrey Botanical Club.* Nos. 4-6. April, June.  
*Bourdon Scientific Review.* Nos. 7-11. May, July. Brunswick, Maine. [\$2 a year.]  
*Address to New York State Agricultural Society, on the Rational and Irrational Treatment of Animals.* By Professor James Law. 8vo. pamph., Albany, 1870.  
*Memorial of Benjamin P. Johnson.* By M. R. Patrick. N. Y. Agric. Society. 8vo. pamph., 1870.  
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*Proceedings of the Royal Society of Edinburgh.* 8vo. Vol. VI. 1868-9.  
*Transactions of the Edinburgh Geological Society.* 8vo. Vol. I. 1868-70.  
*Bulletin de l'Institut National Genevois.* Vols. I-III, 1853-6; Vol. VI, 1857; Vol. IX, 1861; Vol. XI, 1864; two parts of Vol. XII, 1864-5; Vols. XIII-XV, 1865-69, and Vol. XVI, pp. 1-223, 1869, 12 vols. 8vo. Geneve.  
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